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The Value of a Loss: The Impact of Restricting Tax Loss Transfers

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The value of a loss: The impact of restricting tax loss transfers*

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Abstract

We study the economic consequences of anti-loss trafficking rules, which disallow the use of loss carry-forwards as tax shield after a substantial ownership change. We use staggered changes to anti-loss trafficking rules in the EU27 Member States, Norway and United Kingdom from 1998 to 2019 and find that limiting the transfer of tax losses reduces the number of M&As by 18%. The impairment is driven by loss-making targets. Turning to the broader impact on industry dynamics, we find decreases in survival rates of young companies in response to tighter regulations. Some of these start-up deaths are compensated by new firm entrants. We further detect that loosening of regulation spurs firm entry and survival. Finally, tightening (loosening) anti-loss trafficking rules impairs (increases) return on assets, especially for R&D-intensive firms that are more prone to loss-making in their life cycle.

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1 Introduction

In 2008, bids for the struggling US bank Wachovia increased more than sevenfold within days after a limitation on the transfer of tax losses was temporarily suspended (Choi et al., 2019). The suspension allowed an acquirer to use Wachovia's tax loss carryforwards (LCF) post acquisition to generate considerable tax savings. This anecdote suggests that tax savings may be a pivotal determinant of M&A. However, there is only scarce evidence of how limitations on the transfer of tax losses can affect total M&A and no systematic evidence on whether there exist wider economic repercussions for firms.

This is a highly relevant question because most major economies (including the United States and many European countries) have restricted tax loss transfers in corporate takeovers. These regulations may risk distorting the M&A market, an essential driver for economic growth (David, 2021); limits on loss-transferability may be especially harmful when it comes to transactions involving R&D-intensive targets, which are more prone to loss-making, especially early in their life cycle. M&A can significantly shape industry performance, both directly by influencing the combined equity value of a target and acquirer (e.g., Bradley et al., 1988; Morck et al., 1990; Devos et al., 2009; Li, 2013) and indirectly by influencing entry and exit decisions in anticipation of future M&A (Dimopoulos and Sacchetto, 2017). We therefore contribute to the literature by exploring the broader economic effects of limits on loss transfers on firm entry and exits, and industry-performance in R&D-intensive risk-taking industries.

Typically, countries treat losses asymmetrically for tax purposes. They tax profits, but they do not immediately give tax refunds for losses; the losses must be carried over to the past (loss carryback or LCB) or future (LCF). Anti-loss trafficking rules determine the extent to which targets' intertemporal losses can be used to reduce taxable income after takeovers. If taxable losses can be transferred without limitation, profitable buyers can acquire loss-making targets and use the losses as tax shields (Auerbach and Reishus, 1988). Anti-loss trafficking rules aim to protect government revenues and prevent tax-driven transactions by restricting the use of acquired losses when there are substantial changes in ownership or activity. Whether these rules are desirable for economic value creation is unclear. Theoretically, they can hinder or foster the realization of pre-tax synergies in M&A, depending on whether the value of tax losses outweighs the potential nontax synergy gains [Erickson et al., 2019].

If a government restricts the transfer of accumulated losses when ownership changes, the tax asset does not carry value for the acquirer. This reduces the price the acquirer is willing to pay for the target but not the reservation price of the seller, which can affect the acquisition decision. Anecdotal evidence indicates that enforcing or loosening anti-loss trafficking rules substantially affects M&A values. The Wachovia example above is one among several showing how the ability to utilize the target's tax assets can shape the probability of a deal

and the final value.[1] In fact, companies actively use net operating loss poison pills to reduce the likelihood of being taken over, as the ownership change would trigger anti-loss trafficking rules (Sikes et al., 2014). First, we hypothesize that anti-loss trafficking rules can affect the probability of a deal occurring as offer and reservation prices diverge. Second, changes in the probability of deals happening will have broader economic consequences for industry dynamics.

The lack of comprehensive institutional data – in conjunction with a lack of proper "within country" counterfactuals – has inhibited empirical analyses of anti-loss trafficking regulations. To address this issue, we hand-collect detailed information from tax guides and national tax codes[2] of EU27 Member States, Norway and United Kingdom to generate a comprehensive dataset of anti-loss trafficking rules in place from 1998 to 2019. We identify 17 changes in legislation during this period: the rules were tightened eight times and relaxed nine times. This allows us to select treatments for our analysis that do not coincide with other economic events (such as the 2008 Financial Crisis) and that occur in countries with sufficient coverage of M&A in our sample.[3]

We adopt a stacked cohort difference-in-differences research design, relying on the timing differences in these reforms to evaluate the economic consequences of restricting the transfer of losses across countries. This provides us with control groups, which we would lack in a within-country approach, enabling us to identify the treatment effect of this type of regulation. Due to the staggered implementation of these legislative changes and a comprehensive set of control variables, our empirical identification resembles a quasi-experiment, similar to the one of Baugh et al. [2018] or Fuest et al. [2018]. In additional tests, we exploit within-country variation in the LCF status and industry affiliation in a triple difference-in-differences design, which allows us to additionally control for country-year specific shocks.

We begin our study by investigating the effect of anti-loss trafficking rules on the market for corporate control, examining M&A numbers. For this purpose, we combine our hand-collected institutional information with micro-level data from Zephyr, covering over 145,000 M&A in the EU27 Member States, Norway and United Kingdom. Using a difference-in-differences strategy, we find that anti-loss trafficking rules reduce the number of deals at the country level by about -18% on average. These effects are driven by loss-making targets with a drop of 27%. We do not find an effect when running a placebo test on M&A with profitable targets, which suggests the observed treatment effect on M&A with loss-making targets is indeed due to changes in anti-loss trafficking regulations. We formally test this relationship in a triple difference-in-differences design. Starting from changes in M&A activity between treated and control countries (second difference), we additionally compare the effect on loss-making targets versus targets without losses prior to the deal within a country (third

[1] For additional examples collected from the news and court cases, please refer to Appendix C.

[2] See Bührle and Spengel [2020] for details of the regulatory framework.

[3] In robustness tests, we rule out that other major tax reforms that can affect M&A drive our results.

difference). This allows us to control for country-year fixed effects. The results of this more extensive specification confirm our initial findings, suggesting a highly significant average decrease in M&A of -19% for loss-making targets versus non-loss-making targets within treated countries.

We next study the broader economic consequences of anti-loss trafficking rules, that is, consequences on firm exit and entry, and industry-level performance. In our initial tests, we showed that loss firms are significantly less likely to be M&A targets in the presence of strict anti-loss trafficking regulations. Whether this change improves or hurts capital allocation is unclear, as anti-loss trafficking rules may affect both persistently underperforming money-losing firms and firms for which losses are a necessary but temporary part of their life-cycle, such as startups or R&D-intensive firms.

The theoretical model of Dimopoulos and Sacchetto [2017] suggests that firms' exit and entry decisions are affected by the possibility of their being acquired. On the one hand, loosening anti-loss trafficking rules might thus induce unproductive firms to stay alive, due to the value of their tax shield. This can lead to overinvestment and industry underperformance in line with existing evidence on investment effects of reducing the asymmetric treatment of losses and profits of Bethmann et al. [2018] and Olbert [2022]. Additionally, M&A motivated primarily by the value of the target's tax shield may crowd out other potential deals with synergy gains in a search-and-matching M&A market. A lack of anti-loss trafficking rules would thereby stifle industry performance, as it inhibits those firms that rely on a well-functioning M&A market.

On the other hand, loosening of anti-loss trafficking rules may encourage startup formation and survival and R&D, as it increases the net present value of loss-making investment scenarios, due to the loss tax shield being transferable. It also facilitates changes in ownership, which are necessary for scaling up and relaxing the financial constraints of growth firms without having to forfeit tax-deductible accumulated losses.[4] Hence, looser regulation can lead to more competition, which induces even more technology investments by incumbents (McGowan et al., 2017), generating positive spillovers to the whole industry. In general, firms may exhibit less risk-aversion if anti-loss trafficking rules are loose, which would comport with evidence on LCBs and LCFs increasing risk-taking (Ljungqvist et al., 2017; Langenmayr and Lester, 2018; Osswald and Sureth-Sloane, 2020).

To study the impact of anti-loss trafficking rules on young firm exit and entry rates, we rely on industry-country-level data from Eurostat and employ an industry-level stacked cohort difference-in-differences analysis with industry-country and industry-year fixed effects. Hence differences in exit and entry rates, due to industry time trends and time-invariant industry-country characteristics, are eliminated. The specification allows a within-industry comparison of the effect of a change in anti-loss trafficking rules between industries in treated

[4]Put another way, the loss of the tax shield may outweigh the nontax synergy gains from an acquisition (Erickson et al., 2019), thereby inhibiting necessary changes in ownership.

countries and counterfactual industries from the same industry year in nontreated countries.

Given the observed reduction in M&A activity, the expected direction of the effect is clear for firm exit, i.e., less availability of potential acquirers will likely reduce the chances of survival. Consequently, we find a significant average reduction in survival rates of about -4 percentage points for young firms relative to all entrants of that age group. This effect is driven both by decreases and increases in survival rates after tightening and loosening of legislation, respectively.

The expectations for firm entry are less straightforward. If more firms liquidate following a tightening of anti-loss trafficking rules, this can free up market space and stimulate entrepreneurship. Yet, firms might also be discouraged to enter the market in the first place if the regulatory change leads to a lower acquisition likelihood as a valuable exit strategy. Our results indicate an average decrease in firm birth rates of -1 percentage points, relative to all active firms. When differentiating between tightening and loosening in legislation, we find increases of around 1 percentage point for both indicators. The positive effect of tightening in legislation suggests that the freed-up space for start-ups due to increased exit overcompensates the threat of reduced acquisition chances later in life.

Last, we study industry-wide performance effects especially in risk-prone R&D intensive industries by aggregating firm-level measures for the whole population of EU firms (i.e., public and private) from Orbis for the years 1998-2019 at the industry level. As we do above, we employ an industry-level difference-in-differences analysis. To capture mean industry performance, we use the mean return on assets of that industry weighted by firm sales. We find that a tightening of anti-loss trafficking rules results in an 3 (1) percentage point decrease in performance in high (lower) R&D industries. In line with our expectation, this effect is more pronounced in risk-prone R&D-intensive industries. We confirm this finding in a triple difference-in-difference design, including country-year fixed effects.

We run several robustness checks to validate our assumptions. We carefully check that no other local events[5] may cause both changes in anti-loss trafficking rules and changes in firm behavior, establishing a spurious correlation between taxes and firm performance or M&A. We show that local economic shocks, measured by GDP trends and trade trends pre reform, do not evoke the introduction or changes of anti-loss trafficking rules. Nevertheless, to ensure that economic conditions between control countries are comparable to treated countries in our sample, we run all our estimations in a sample that is entropy-balanced on the level of pre-treatment GDP and trade between treated and control countries. The results are reported in the online appendix, and very similar to our baseline results. Finally, the dynamic event study figures support that treatment and control groups follow parallel trends before the treatment.

This paper contributes to the literature on the determinants of M&A and M&A effects on

[5]We discuss possible confounding events in the appendix D and control for these in all our regressions. This includes controlling for changes in tax LCF and LCB legislation and corporate tax rate changes.

corporate decisions. Studies by, for example, Rossi and Volpin [2004]; Erel et al. [2012]; John et al. [2015]; Cao et al. [2019]; Dessaint et al. [2017] show that economic and institutional factors, such as international trade integration, financial reporting quality, political uncertainty, and regulations on shareholder and employment protection, can shape the market for corporate control. We illuminate the impact of tax-related incentives on takeovers and how they shape market structure and corporate investments. Research has indicated that taxes affect acquisition decisions (e.g., Di Giovanni, 2005; Arulampalam et al., 2019; Huizinga and Voget, 2009; Meier and Smith, 2020; Blouin et al., 2021) and deal values (e.g., Kaplan, 1989; Hayn, 1989; Ayers et al., 2003; Huizinga et al., 2012, 2018; Blouin et al., 2021). When considering the effect of limiting the transfer of losses for tax purposes, empirical evidence so far suggests that it affects the market value of listed corporations (Moore and Pruitt, 1987). We offer the first evidence documenting broad and substantial economic consequences of restricting and loosening anti-loss trafficking rules. In particular, we provide novel empirical evidence of the analytical results of Dimopoulos and Sacchetto [2017] by showing that shocks to M&A activity have wider repercussions on firms' risk-taking, entry, and exit rates as firms adjust their expectation of being a valuable target in future M&A transactions.

We also add to the literature on behavioral responses to tax policy. The literature shows that taxes influence investment decisions (e.g., Heider and Ljungqvist, 2015; Giroud and Rauh, 2019; Djankov et al., 2010). The results of our study illuminate possible unintended consequences of restricting the transfer of losses for tax purposes. Several studies show that managers take real actions to preserve the value of tax losses (e.g., Maydew, 1997; Erickson et al., 2013; Erickson and Heitzman, 2010; Sikes et al., 2014). Research shows that more generous tax loss rules stimulate risky investment (Ljungqvist et al., 2017; Langenmayr and Lester, 2018; Armstrong et al., 2019; Bührle, 2021). Bethmann et al. [2018] and Olbert [2022] demonstrate that they might also encourage poorly performing businesses to overinvest. Our paper complements these studies by documenting that limiting the benefits from tax losses in M&A can shape the probability of being acquired firm entry and exit, and reduce overall industry performance especially in more risk-prone R&D-intensive industries.

Finally, our results have important policy implications. For example, the COVID-19 crisis resulted in a massive negative economic shock and triggered unprecedentedly quick government responses worldwide.[6] To support economic growth, it may be most effective to implement measures that target young and R&D-intensive companies. Our results suggest that relaxing the restrictions on the transfer of tax losses in case of substantial changes in ownership could be considered after crisis. We test the economic consequences of such a policy on the market for corporate control and industry-wide performance. We find that looser regulations stimulate M&A and lead to more enterprise births, increased entrant survival

[6]OECD (10 June 2020), Evaluating the initial impact of COVID-19 containment measures on economic activity, available at https://read.oecd-ilibrary.org/view/?ref=126_126496-evgsi2gmqj&title=Evaluating_the_initial_impact_of_COVID-19_containment_measures_on_economic_activity.

and improved performance in R&D-intensive industries. In this way, our study informs policymakers of potential unintended consequences of restrictive loss transfer regulations. For a comprehensive assessment of the legislation, these downsides have to be weighted against the tax revenues that can be protected by denying loss offset. As we lack the data for the quantification, we call for future research to explore this trade-off.

The remainder of this paper is organized as follows. Section 2 provides the institutional background. Section 3 develops the hypotheses. Section 4 presents the research design, including the empirical strategy, the data, and sample selection. Section 5 describes the main results and robustness checks. Section 6 concludes.

2 Institutional background

If losses cannot be used to reduce profits incurred from other activities in the same period, they must be carried back to the past (LCBs) or over to the future (LCFs). Changes in ownership or activity can activate anti-loss trafficking rules, resulting in the forfeiture of accumulated LCFs. In other words, the LCF stock at the time of acquisition vanishes entirely and thus losses its value when the restriction is triggered.[7] Without these rules, unprofitable corporations with high LCFs can be bought and merged with profitable companies to benefit from the tax loss shield. Anti-loss trafficking rules assume abuse based on codified criteria.

Most European countries have implemented anti-loss trafficking rules. We observe 17 introductions or changes in legislation over our sample period. These reforms are not endogenous to economic conditions, which is important for identification in our analysis. The reasons for the introduction of anti-loss trafficking regulations are often idiosyncratic and out of the public eye, involving very low media coverage. Reasons for loosening these kinds of regulations are similarly idiosyncratic. Importantly, we find no anecdotal evidence that loosening or tightening tax loss trafficking rules is considered as fiscal stimulus. We identify two trends over time. On the one hand, more countries introduced anti-loss trafficking rules over the years. On the other, regulations became less restrictive; i.e., the bar for losses to be denied after a transaction was set higher. Regulations are usually introduced or tightened out of the political desire to protect tax revenue, along with the general trend toward stronger anti-abuse legislation in different areas of taxation during the last decades. We also observe other exogenous reasons that require changes in legislation. For example, the German Federal Constitutional Court ruled parts of the regulations as unconstitutional, forcing the German legislature to adjust the law.[8] Importantly, we do not find any indication of

[7] If the loss offset for pre-acquisition LCFs were simply restricted to profits generated by the acquired company, the new owners could shift profitable activity into the acquired company to circumvent the regulations.

[8] Duttiné, T. (May 2017), German Federal Constitutional Court decides that German loss forfeiture rule is unconstitutional, available at https://www.nortonrosefulbright.com/en-

anti-loss trafficking legislation being implemented or changed in response to local economic conditions in our sample. In particular, there is no pre-trend in GDP or international trade in the run-up to changes in these regulations.[9]

The tax loss transfer restrictions commonly require a substantial change in ownership or activity as triggers; the definition of these criteria depends on national legislation. For our analysis, we assess whether changes in legislation loosen or tighten regulations. We thus rank regulations according to the following dimensions (by increasing strictness). Cumulative regulations require a change in ownership and a connected change in activity. If there is either only a change in ownership or only a change in activity, this type of restriction is not triggered. Alternatively, rules can mandate the forfeiture of losses after a change in activity, independent of any changes at the ownership level. A third type of anti-abuse regulation relies solely on a change in ownership. Fourth, countries can relate their loss transfer restrictions to either a change in ownership or a change in activity; the fulfillment of either criterion is sufficient. We consider regulations that depend solely on a change in ownership or activity to be more restrictive than those triggered only when both occur simultaneously. Table 1 provides an overview of the different categories ranked by strictness. Newly introduced (abolished) anti-loss trafficking regimes always constitute a tightening (loosening) in legislation. If the legislator adjusts an ownership-based regime by adding a cumulative activity criterion, we define the change as a loosening. In contrast, if the activity criterion is omitted and the rule relies on changes in ownership only, legislation has been tightened. Some countries create exemptions. These so-called escape clauses vary by country and include reorganizations within groups, quoted companies, availability of hidden reserves, and providing compelling economic reasons to tax authorities. The burden of proof of non-abuse rests upon the taxpayer.[10]

3 Hypothesis development

3.1 Tax loss transfer and M&A

The transferability of losses from the target to the acquirer can determine the success of a merger or acquisition, as tax losses constitute valuable assets (Hayn, 1989). If losses can lower the tax liability, they can increase the acquirer's willingness to pay (Auerbach and Reishus, 1988). However, if the ownership change causes accumulated losses to be non-deductible for tax purposes, this may reduce a potential acquirer's willingness to pay. The seller's reservation price does not change, as the losses remain with the target until the deal

mh/knowledge/publications/d767331c/german-federal-constitutional-court-decides-that-german-loss-forfeiture-rule-is-unconstitutional.

[9] See also Figure 6 and Section 4.2.

[10] We control for exemptions in our analysis. For more details, see Appendix B.

occurs. Only if the expected nontax synergies are sufficiently high for the acquirer will the deal still happen (Sikes et al., 2014).

Absent anti-loss trafficking rules, purely tax-driven M&A may occur since, with no limitation on the transfer of losses, even deals with negative pre-tax synergies can be attractive for firms as long as the value of the losses to the acquirer is sufficiently high.[11] Thus, despite negative pre-tax synergies, the combined company can generate a larger after-tax income from the merger. However, anti-loss trafficking rules can also affect acquisitions that are not tax-driven by putting a wedge between buyers and targets reservation prices, inhibiting the realization of synergies.[12]

We expect that the number of deals in a country shrinks in response to the introduction or tightening of anti-loss trafficking rules as only those M&A still take place for which the expected synergies are sufficiently large. Whether deals that are prevented due to anti-loss trafficking legislation are purely tax-driven is theoretically unclear. We therefore broaden our analysis and investigate the consequences of inhibited M&A at the industry level.

3.2 Tax loss transfer, industry dynamics, and industry performance

The size, timing, and uncertainty of tax payments and deductions can create distortions in the expected profitability and valuation of a project, making taxes a critical determinant of corporate decisions. For example, we know that changes to corporate tax rates shape industry dynamics, like the entry and exit of firms and investment decisions (Hanlon and Heitzman, 2010; Jacob, 2022) and that tax deductions stimulate investment including M&A

[11] This can be shown on a simple numerical example taken with slight adaption from Erickson et al., 2019 (Erickson et al., 2019 generalize this example in a parsimonious model in their appendix): Assume a target with $100 in usable net operating losses (NOLs) and poor future economic outlook that expects to generate $ 60 in net present value terms. Let the tax rate be 50%. If the corporation stays independent, it will generate taxable income of $0. While after-tax profits will be $60, pre-tax income will be too small to use all its NOLs. Now assume a buyer without NOLs with future taxable income of $80 and consequently after-tax income of $40. The combined after-tax income pre-merger is therefore $100. In case of no limitations on NOL use, the acquisition would lead to an increase of combined pre-tax income of $ 140 and after-tax income to $ 120 ($80+$60-($80+$60-$100) *0.5), if there were no synergies generated from the merger. Even if we assume negative synergies, i.e., value destruction, of -$20, the combined after-tax income would be $110 ($120-($120-$100)*0.5).

[12] We can show this again in a simple numerical example that is taken with slight adaption from Erickson et al., 2019, who generalize this example in a parsimonious model in their appendix: Suppose a target has NOLs of $100 and can use after a merger only 30% ($30) of them. Further, assume that the merger will generate synergies of $20. The combined pre-tax income of the target and acquirer as standalone firms will be $140. It would increase to $160 due to the merger. Nevertheless, the merger is not beneficial, as the combined after-tax income of the target and acquirer pre-merger would be $100 ($60+$80-($80*0.5)), while after merger the NOLs would be lost and therefore combined after-tax income would fall to $95 ($160 - ($160-$30) * 0.5).

(Blouin et al., 2021; Lester, 2019). Moreover, the asymmetric treatment of losses and profits in most tax systems around the world has been shown to impact firm behavior. A relaxation of the asymmetric treatment of tax losses can encourage risky investments (Ljungqvist et al., 2017; Langenmayr and Lester, 2018; Armstrong et al., 2019; Bührle, 2021), affect firm performance (Olbert, 2022), and stimulate innovation (Guceri, 2020). In special circumstances, asymmetric loss treatment can increase investment as Hillmann and Jacob [2022] show that time limits on the use of LCFs increase investment by loss-making firms, especially among those firms that can quickly generate profits to use the time-limited LCF. Furthermore, Osswald and Sureth-Sloane [2020] point out that a country's political and fiscal budget risk can attenuate the effectiveness of tax policy tools such as the extension of LCB and LCF.

So far, we know little about how limiting the transfer of losses in case of ownership change affects industry dynamics. Anti-loss trafficking rules put a wedge between buyers' and targets' reservation prices, affecting a firm's chances of future involvement in takeovers. As highlighted in section 3.1 above, this can lead to the forfeiture of pre-tax synergies or prevent purely tax-driven transactions. Furthermore, following Dimopoulos and Sacchetto [2017], a decrease in the probability of future mergers is likely to alter industry dynamics not only through the forfeiture of direct deal synergies but also by affecting young firm entry and exit rates.

On the one hand, anti-loss trafficking rules can improve capital allocation by discouraging unproductive firms from staying alive, absent the financial incentives from the tax benefits. Vice versa, loosening of anti-loss trafficking rules might induce underperforming firms to overinvest and could foster their continued survival. On the other hand, the forfeiture of LCFs is particularly painful for idiosyncratic-loss firms, like innovative startups, which face financial constraints due to limited collateral. Relaxing the financial constraints of developing firms and scaling these firms up frequently requires substantial changes in the set of owners. However, the value of the firm decreases markedly if the previously incurred losses are no longer deductible after the ownership change, thereby increasing the likelihood that the firm remains on a smaller-than-optimal growth path or closes down due to ownership changes being inhibited. As capital providers anticipate these frictions, some firms will not even be founded in the first place.[13] Moreover, investing in innovative and risky projects may require several years before generating profits. Hence, if entrepreneurs consider future tax loss shields in their decision-making regarding market entry and exit, stricter anti-loss trafficking rules will discourage the birth of firms and might jeopardize the survival of innovative startups. Since also firms with existing losses are affected, this has immediate consequences on industry performance especially in risk prone R&D-intensive industries. In contrast, loosening anti-tax loss trafficking rules can stimulate M&A in industries with id-

[13]Firm entry can be affected without founders knowing about the existence of anti-loss trafficking rules because it suffices for financially savvy capital providers to be aware of the effect of anti-loss trafficking rules on targets' market values.

iosyncratic losses and startup entry. For example, Bena and Li [2014] shows that mergers in R&D intensive firms generate synergies that lead to increased technological outputs. This will also put incumbents under pressure to innovate and increase industry performance.

Thus it is unclear whether anti-loss trafficking rules improve or harm capital allocation and subsequently whether they affect industry performance especially in risky innovative industries.

4 Empirical strategy

4.1 Data

Data on anti-loss trafficking rules: We hand-collected information on anti-loss trafficking rules across the EU27 Member States, Norway and United Kingdom using the IBFD tax research platform as well as the respective country's tax code for the years 1998-2019. In 2019, 20 of the member states had anti-loss trafficking rules, as visible in Figure 1, with substantial variation in design across countries (Bührle and Spengel, 2020). Overall we observe a total of 17 changes in legislation in 11 countries (see Table 2). Regulations were tightened eight times and relaxed nine times. The number of changes exploited in each regression can differ. We exclude any reform that occurred two years before or after the 2008 Financial Crisis (i.e., 2006-2010) as unobserved factors would dominate our outcome variables, such as M&A and industry performance, in an extremely heterogeneous manner. Furthermore, the sample horizon in the industry-level regressions is constrained by data availability.[14]

Data on M&A: We collect data on M&A deals from Zephyr over the years 1998-2019 in the EU27 Member States, Norway and United Kingdom disregarding countries without M&A (less than one transaction per year on average). To account for the applicability of anti-loss trafficking rules, we consider all transactions with unlisted targets, in which more than 50% of the firm changes ownership. We have a total of about 145,000 transactions across our sample period. For our analysis, we count M&A deals at the country-year level while differentiating between loss and non-loss targets.

In panel (a) of Figure 2, we plot, for reforming countries, the development of M&A involving loss-making targets around the change in legislation. We normalize coefficients to the year before the change and only include country and year fixed effects to show the basic time trends in the data. The graph indicates a clear and significant decrease in M&A following changes in anti-loss trafficking rules. We take this as initial evidence in support of our hypothesis that the restrictions discourage M&A. In our main analysis, we formally test the hypothesis in a stacked saturated difference-in-differences specification in section 5.1.

[14]The data on entry and exit start in 2004.

Data on industry dynamics: We gather data on firm births and survival rates for the years 2004-2019 from Eurostat's Business Demography Database.[15] From this dataset, we obtain data on the birth and survival rate for the total population of firms in each EU country aggregated by industry-country-year (at the NACE two-digit level).

Data on industry performance: To study the effects of anti-loss trafficking regulation on overall industry performance, we construct an industry-country panel for the whole population of EU firms combining data from Orbis for the years 1998-2019, gathering information from Orbis discs 2008-2019. We begin our sample by selecting all firms located in the EU27 Member States, Norway and United Kingdom and obtain financial statement information at the unconsolidated level. We exclude companies from financial and extractive industries or with negative total assets, employees, sales, or tangible fixed assets. Finally, we calculate the sales-weighted average ROA at the industry-country-year level, where the industry is the two-digit NACE. We retain industry-level observations if this ROA average is based on at least 50 firms.

Panel (b) of Figure 2 depicts the time trends of performane (proxied by sales-weighted industry ROA) in reforming countries and differentiating between industries with high and low R&D intensity. We again normalize coefficients to the year before a change in anti-loss trafficking rules and only include country and year fixed effects as basic controls. The graph shows a clear decline in performance after changes in legislation for R&D intensive industries. This suggests that strict anti-loss trafficking rules impair industry performance, especially in industries where high development costs and initial losses are to be expected. We do not find a similar pattern in low R&D industries. We provide stringent tests in a complete difference-in-differences analysis in section 5.3.

Data on control variables: The control variables are collected from various sources. Macro data on GDP, inflation, trade, and value-added are taken from the World Bank.[16] Population data comes from the United Nations.[17] Moreover, we obtain statutory corporate tax rates[18] and an indicator for EU membership from the European Commission[19]. Finally, we collect the audit and reporting quality indicators from the Global Competitiveness Report conducted by the World Economic Forum.[20]

All continuous variables are winsorized at the 1% and 99% levels. We present the sum-

[15]For more information on the data, see Eurostat Data Browser, available online at https://ec.europa.eu/eurostat/databrowser/view/bd_9bd_sz_cl_r2/default/table?lang=en.

[16]The World Bank data are available at https://databank.worldbank.org/source/world-development-indicators

[17]The United Nation data are available at https://population.un.org/dataportal/home

[18]The EU Commission data on corporate tax rates are available at https://taxation-customs.ec.europa.eu/taxation-1/economic-analysis-taxation/economic-studies_en

[19]The EU commission data on EU membership are available at https://neighbourhood-enlargement.ec.europa.eu/enlargement-policy/6-27-members_en

[20]The World Economic Forum data are available at https://www.weforum.org/reports/the-global-competitiveness-report-2020/

mary statistics for all variables in Table 3.

4.2 Empirical specification

4.2.1 Identification strategy

The staggered changes in legislation allow us to control for common unobserved confounding factors at the country level that do not change over time, common EU-wide time trends, and observed time-variant country-specific factors. Based on the recent literature that points out potential confounding factors in staggered difference-in-differences designs, we investigate the effect of anti-loss trafficking rules in a stacked cohort difference-in-differences design following the approach of Cengiz et al. [2019] (see also Baker et al., 2022). The estimation datasets throughout our analysis are calculated as follows. We construct a separate cohort dataset for each treatment event, where the treatment event is defined at the year level. In each cohort dataset, the treated group is composed of countries that change the anti-loss trafficking rule in the year corresponding to the treatment event, while the control group is composed of countries that change the anti-loss trafficking rule more than five years later or never during our sample period. We restrict observations in each cohort dataset to the five years pre and postchanges in the treated countries. In this stacked design, we deal with repeatedly treated countries by dropping the second treatment if it is less than five years apart from the first. (This is relevant only for Greece, with a second treatment in 2018.) We run all regressions on the stacked cohort dataset. In robustness analyses, we rerun our analysis in a nonstacked standard staggered difference-in-differences design.

A concern for our identification could be that the decision to change anti-tax loss trafficking rules is systematically correlated with economic conditions in the treated countries, and our findings would then be confounded by spurious correlations. If so, countries that adopt anti-loss trafficking rules would have differing trends with regard to core economic factors, compared to countries in our control group (countries without a change in anti-loss trafficking legislation). To address this concern, we show in robustness tests in Figure 6 that pre-trends in important economic outcomes, GDP, and trade (as defined in Appendix A) are parallel between our treated and control groups. This approach follows similar tests of Fuest et al. [2018]. In the industry-level analysis, we control for industry shocks across countries with industry-year fixed effects and for country-specific industry fixed factors with country-industry fixed effects. In addition, we exploit within-country variation in triple difference-in-differences specifications and control for country-year-specific effects. This specification allows us to rule out that country-specific shocks affect our results, as we are comparing firms subject to different treatment intensity within the same country-time to each other.

4.2.2 Tax loss transfer and M&A

We start our analysis by investigating the overall effects on M&A at the country and target type level (loss or non-loss target); only loss targets should be affected by treatment, and non-loss targets in treated countries should remain unaffected. We use past accounting losses as the best proxy for tax LCFs.

First, we adopt a stacked difference-in-differences identification strategy to obtain a comprehensive measure of the average effect.

$$Outcome_{ctl} = \alpha + \beta_1 * ChangeALT_{ct} + \rho * Controls_{ct} + \sigma * FE_c + \delta * FE_t + \epsilon_{ctl}. \quad (1)$$

c stands for country, l for target type (loss or non-loss target), and t for year. For simplicity of exposition, we omit the cohort indicator since we always use a stacked specification. As the outcome, we define the logarithm of the number of M&A aggregated at the country-target type level by year.[21] In the spirit of Dessaint et al. [2017], we construct a treatment indicator that takes the value of 1 (-1) if a country tightens (loosens) anti-loss trafficking rules. Thus, the indicator variable of interest, $ChangeALT_{ct}$, increases (decreases) by 1 if a country tightens (loosens) anti-loss trafficking rules. The value does not change in the following years as long as the regulation remains. To show the effects separately for tightening and loosening, we construct two separate treatment indicators, one that takes the value of 1 if a regulation tightens and the other takes the value of 1 if a regulation loosens and zero otherwise ($TighteningALT, LooseningALT$).

Our country-level control variables include the lagged log of GDP, lagged GDP growth, the log of population, lagged inflation, a country's audit quality, a dummy for EU membership, the annual growth rate of value added of the service sector in percent of GDP, trade openness, and the corporate tax rate. We add controls for tax loss regulations, namely, a dummy for the presence of LCF or LCB regulations, and an escape clause dummy that controls for exemptions to the anti-loss trafficking rules.

We include country and year fixed effects at the cohort level. Standard errors are clustered at the country-cohort level, the level of treatment variation. The fixed effects structure in this analysis allows estimating the M&A effects on the country-level pre- versus post-treatment (first difference), relative to counterfactual deals in untreated countries (second difference) (within cohort). Differences in M&A, due to time trends across countries and time-invariant country characteristics, are eliminated. Controlling for other time-variant factors that influence the investment decisions in the same country, any remaining change in the treated versus the control country should be attributable to the change in anti-loss

[21] Using country-level-target type aggregates in the M&A deal analysis, we overcome econometric concerns about skewed datasets due to many zero observations [Cohn et al., 2022]. We only have 20 zero observations in our dataset, which drop from the sample when considering the logarithmic outcome. When aggregating at the country-industry level the number of zero observations would be significantly larger.

trafficking rules. In this M&A deal analysis, we reduce concerns that our estimates are affected by country-level confounds by splitting our analysis into treated loss and non-treated non-loss target firms within-country. To tighten the identification further, we conduct a triple difference-in-difference estimation interacting all right-hand side variables with the loss status of the targets. The third difference allows us to estimate the effect between loss and non-loss targets within the treated country. With additional country-year fixed effects we can control for concurrent confounding events in the country of treatment.

Second, we investigate the dynamic effects over time in a stacked event study:

$$Outcome_{ctl} = \alpha + \sum_{m=-4}^{4} \gamma_m * Treat_{cm} + \rho * Controls_{ct} + \sigma * FE_c + \delta * FE_t + \epsilon_{ctl} \quad (2)$$

The variables are defined as in Equation 1. We include the treatment at the event time as well as four leads and lags of the treatment indicator ($Treat$). The treatment indicators are binned at endpoints, such that t-4 would indicate treatment at time t-4 and all previous years, and t+4 would indicate treatment at t+4 and all following years. Hence we do not interpret the coefficients for t-4 and t+4. Coefficients are normalized to zero based on the level in the period preceding the treatment (t-1).

4.2.3 Tax loss transfer, industry dynamics, and industry performance

Further, we estimate whether the market structure, overall industry performance in a country change in response to the introduction or tightening of anti-loss trafficking rules. We extend Equations 1 and 2 to the industry level (within a country), testing different industry-level outcomes. The more fine-grained aggregation level allows us to minimize the possibility of other simultaneous disturbances affecting the treated countries. By utilizing this aspect of the data, we can control for industry-specific shocks across countries and country-industry fixed effects.

With a view to market structure, we are interested in how the entry and exit of young firms are affected by anti-loss trafficking regulations. For this purpose, we examine changes in the survival rate of young entrant and firm entry measured by the birthrate in the industry. Additionally, we examine overall industry performance by studying the impact of anti-loss trafficking rules on the country-industry performance measured as the average return on assets weighted by firm sales.

We control for the logged sum of total, fixed, and cash assets at the country-industry level in addition to the country-level control variables used in Equation 1.[22] Our industry-

[22]For tests with firm birth and survival rates, we cannot control for total, fixed, and cash assets. Eurostat does not provide the necessary data for industry-level controls and we cannot employ the industry controls derived from the full universe of firms in Orbis, as the Eurostat sample only contains a subsample of young

level specification includes industry-country and industry-year fixed effects at the cohort level. Residuals are clustered at the country-cohort level. With this structure, we compare industry-country effects pre- versus post-treatment (first difference), relative to counterfactual industries from the same industry year in countries that are untreated (second difference) (within cohort). Standard errors are clustered at the country-cohort level.

5 Results

5.1 M&A

Anti-loss trafficking rules restrict the use of losses after substantial changes in ownership and could thus impair M&A.

Table 4 lists the regression results for the effect of these rules on the number of deals. The first two columns present the baseline results for the *ChangeALT* treatment indicator (column (1)) and the individual dummies for tightening and loosening of rules (column (2)) in the full sample. Rechbauer and Rünger [2023] demonstrate that previous year's earnings reliably proxy for the existence of LCFs. We thus use reported accounting losses to proxy for target firms that are more likely to have LCFs. Columns (3) to (6) display the estimates for subsamples of targets with (columns (3) and (4)) and without reported accounting losses in the year prior to the deal (columns (5) and (6)). All regressions include the full set of controls and fixed effects.

The baseline results show a negative and significant coefficient for the number of deals of -0.20[23] within treated countries, relative to within control countries after treatment (Table 4, column (1)). Tightening of legislation appears to reduce M&A with a coefficient size of -0.23[24], while loosening has a smaller significant effect (0.20)[25] (column (2)). The effects are driven by loss-making targets, for which we find larger and more significant effects (columns (3) and (4)). In this subsample, the overall effect amounts to -0.31[26] The change in M&A involving loss targets is robust to excluding controls (Appendix E.1) or estimation with entropy-balancing (Appendix E.2). The combined effect is driven by both tightening (-0.37)[27] and loosening of legislation (0.31)[28]. For targets without losses in the previous year, the coefficients show the same signs but are smaller and lack statistical significance (columns (5) and (6)).

companies.

[23]This translates into a decrease of -18% = $e^b - 1$, where b = -0.1955.

[24]Decrease of -21% = $e^b - 1$, where b = -0.3116.

[25]Increase of 22% = $e^b - 1$, where b = 0.1955.

[26]Decrease of -27% = $e^b - 1$, where b = -0.3116.

[27]Decrease of -31% = $e^b - 1$, where b = -0.3673.

[28]Increase of 0.37% = $e^b - 1$, where b = 0.3116.

We test whether the difference in coefficients between loss and non-loss targets is statistically significant in Table 5 by employing a triple difference-in-difference design. In column (1) and (2), we use the same specification as in the difference-in-differences approach, but interact all right-hand side variables with the loss indicator. The interaction between the loss indicator and *ChangeALT* confirms that significantly less deals are taking place involving loss-making targets as compared to profit-reporting targets after changes in anti-loss trafficking legislation. The within-country design allows us to include country-year fixed effects. The results of this extended specification confirm our previous findings, suggesting a reduction in M&A activity for loss targets of -0.21[29], with a deterring effect of tightening of -0.30[30] and a positive impact of loosening of legislation of +0.21[31].

Figure 3 displays the event study results. We observe a slight upward trend in the number of deals in the period before treatment, which is consistent with some deals being conducted in anticipation of tighter rules to come. However, overall we do not find pre-treatment trends in M&A; the sum of lead coefficients in the pre-period is not statistically significantly different from zero. This observation gives us confidence in the validity of the underlying parallel-trends assumption. As apparent, loss-making firms are driving the overall decline in deal numbers in treated relative to control countries. In loss targets, the number of deals shows a significant decline from the first year after the change in legislation, which persists.

Overall these findings support the notion that anti-loss trafficking rules impede M&A. More restrictive legislation reduces the number of deals, while less restrictive legislation increases it. The finding that deal number effects seem to be present only for loss-making targets further supports that it is the transferability of losses following a change in ownership that drives the M&A outcomes.

5.2 Market structure: Young firm exit and entry

In addition to the direct effect on M&A, anti-loss trafficking rules can also indirectly affect the market composition if firms anticipate the deterrent effects of the restrictions (Dimopoulos and Sacchetto, 2017). The regulations tend to particularly affect young firms since young firms cannot typically offset their losses with income from other business lines (Henrekson and Sanandaji, 2011). Thus, new companies may give up at an earlier point if they perceive the probability of exit by being acquired as small. Furthermore, the restrictions could discourage the founding of new firms. We thus look at changes in the survival[32] and birth rates. We adjust Equation 1 and Equation 2 and conduct the analysis at the industry level.

In Table 11, we analyze the impact of changes in anti-loss trafficking rules on four-year

[29]Decrease of -19% $= e^b - 1$, where b = -0.2099.

[30]Decrease of -26% $= e^b - 1$, where b = -0.3007.

[31]Increase of 23% $= e^b - 1$, where b = 0.2099.

[32]Note that survival in our dataset allows for acquisition. Only firms that stop operating are considered dead (see the variable definition in Appendix A for more details).

entrant survival rates (columns (1)-(2))[33] and enterprise birthrates (columns (3)-(4)). All regressions include the full set of fixed effects and country control variables. In each group, the first column displays the results for $ChangeALT$ as the main variable of interest. We decompose the regression coefficient to study the differential effect of tightening and loosening of the anti-loss trafficking rules in the second column, showing the results for $TighteningALT$ and $LooseningALT$.

We find a strong negative effect of $ChangeALT$ on survival rates of about -4 percentage points(columns (1)). Compared to a sample average of 56%, this denotes an economically significant reduction in the mean survival rate of young firms by 7%. The effect of tightening and loosening is almost symmetrical (3 versus 4 percentage points, column (2)). We confirm these results in robustness tests in the entropy-balanced sample. This result suggests that the decreased acquisition likelihood reduces survival chances and leads to more young firms exiting the market.

We also find a reduction in birth rates amounting to -1 percentage point (column (3)). However, for both tightening and loosening, the coefficients indicate an average increase in birth rates of around 1 percentage point. We find similar results in the entropy-balanced sample in our robustness checks. This finding can be explained by two opposing effects: As we ascertain with our previous results, stricter anti-loss trafficking rules lead to more firm exits. First, the firms' exits free up market space for new entrants which positively affects birth rates. Second, the decreased survival rates and acquisition likelihood could discourage potential entrepreneurs, as they will incur a higher risk of failure. The positive effect for tightening in legislation indicates that the freed-up market space effect outweighs the lower acquisition likelihood. This might relate to the timing of the effects, given that entrants observe the market concentration at the point of entry, while acquisition considerations might become relevant only later in the firm life cycle. Furthermore, first-time founders might not always be aware of anti-loss trafficking rules. Entrepreneurs could also underestimate their loss probability and the potential impact of tax loss transfer restrictions at a later point of their venture. Finally, and more general, non-tax factors (such as increased market space) might be more prevalent when deciding whether (or not) to establish a new company.

We confirm the difference-in-differences results in a dynamic event study analysis presented in Figure 4, where Panel (a) ((b)) depicts the estimates for enterprise survival (births). The figure indicates that the effect is immediate and persistent in both cases and that the treated and control groups show parallel trends in the pre-periods.

We show that anti-loss trafficking rules not only directly affect M&A but also indirectly

[33]Importantly, we do not consider younger entrant survival (one- to three-year-old entrants), as these firms are founded just a few years before, just around or even after our post-treatment period (one to five years after the law change), and therefore treatment (or treatment anticipation) can affect the entry probability of these firms, which would distort our measure of survival probability. Our results are robust to using the five-year instead of the four-year survival rate. (Five-year survival is the last available measure in the Eurostat database.)

influence young firms' entry and exit. Tighter rules alter the market composition by reducing the survival of startups and looser rules facilitate survival. We also find evidence that the increased market space due to start-up deaths leads to new entrants. However, the improved prospect of future deal involvement fertilizes start-up formation after the loosening of legislation.

5.3 Industry performance

We continue to investigate how anti-loss trafficking rules affect industry performance especially in R&D intensive industries, who may be most affected, to better illuminate the desirability of the legislation. Purely tax-driven acquisitions of loss-making targets could, on average, be prevented, while, at the same time, such rules may also immediately dampen industry performance by limiting the realization of M&A synergies. We use industry-level mean return on assets, weighted by firm sales in the industry, to capture effects on industry performance. Because tax loss forfeiture could be particularly harmful in R&D intensive industries, we split our sample by high and low R&D intensity. R&D intensive firms are more likely to accumulate idiosyncratic losses from risky investments. We use an industry-level R&D intensity indicator based on the OECD Taxonomy of Economic Activities, which clusters activities according to their level of R&D expenditure to value added (see Galindo-Rueda and Verger, 2016). To apply the EU taxonomy of R&D intensity to our data, we must match the industry classification to the NACE2 classification used in our sample. In case an NACE2 category falls in more than one EU category, we always assign the industry to the lower category with respect to R&D intensity. We build a binary measure of R&D intensity, such that we define all industries as R&D intensive, if the EU taxonomy classifies them as medium-high or high R&D intensive, and all industries in our sample of medium, medium-low, or lower R&D intensity as low R&D intensive. We also exploit the within-country variation in firm industry affiliation in a triple difference-in-difference design, which allows us to control for country-year shocks with country-year fixed effects.

Table 12 presents the difference-in-differences results for the effect of the anti-loss trafficking rules on ROA split by high and low R&D intensive industries (columns (1)-(4)) and as a triple difference-in-difference design (columns (5)-(6)). Again we start with $ChangeALT$ as overall measures and then differentiate between tightening and loosening of legislation.

Our results indicate that the mean return on assets in an industry decreases by 1.6 percentage points in response to changes in anti-loss trafficking rules in treated R&D intensive industries versus peer control R&D intensive industries in other countries (column (1)). Relative to the mean ROA of about 9 percent across the whole sample, the effect on ROA in R&D intensive industry is economically sizeable. The effect seems to be driven by introduction or tightening of legislation, as we find a larger effect for $TighteningALT$ (column (2)). Comparing the results for high and low R&D intensive industries – column (1) versus (3) – we find that the treatment effect is 60% stronger in R&D-intensive industries, indi-

cating that performance is reduced in particular in innovative industries, for which initial losses are part of the life cycle. We formally test the difference between the two groups in a triple difference-in-differences design by interacting all right-hand side variables with the industry indicator. The advantage of this specification is that we can additionally control for country-year fixed effects. The regressions indicate highly significant differences between treated companies in high and low R&D-intensive industries and further confirm our results. The event study in Figure 5 corroborates our main findings. It shows a very immediate and substantially larger effect in high R&D industries relative to low R&D industries. We do not observe a significant difference between control and treated country industries in the pre-treatment period.

In sum, our findings indicate that anti-loss trafficking rules impair aggregated industry performance especially in R&D intensive industries. The loosening of legislation seems to mitigate some of the deterrence effects of the legislation, boosting performance. Our results suggest that the increase in performance after the loosening of legislation is caused by relaxing liquidity constraints in risk-prone industries that may carry higher losses.

5.4 Robustness analyses

In this section, we provide additional robustness tests of our analysis. Our event study results already provide support for the parallel trends assumption, and our channel analyses provide confidence that our results are driven by the policy changes we study instead of spurious correlations. For example, we find that effects on M&A are driven by loss targets and that industry performance effects are more pronounced in R&D intensive industries, where the probability of occurrence of idiosyncratic losses from risky investments is higher. To further validate the our assumptions, we conduct additional robustness tests.

We show in Figure 6 that the changes we observe are not driven by differences in pre-trends in economic performance between treated and control countries. The figure shows the trends in GDP and trade in treated versus control countries in a nonstacked sample, only controlling for country and time-fixed effects. GDP and trade are determinants of (cross-border) M&A and measures of industry performance and output. We find no pre-trends in both outcomes.

Additionally, to ensure that treated and control countries are comparable in terms of core observable economic characteristics pre-treatment, we rerun all our tests employing entropy-balancing (Hainmueller and Xu, 2013). Entropy-balancing reduces potential bias introduced by co-variate differences, allowing for more reliable estimation of causal effects and enhancing the validity of our causal inferences.[34] We match treated and control firms within each cohort on pre-treatment GDP (measured as log of purchasing power adjusted

[34] Athey and Imbens, 2017 describe this approach for a generalized matching introduced by Hainmueller and Xu, 2013 as substantial improvement beyond the standard difference-in-differences analysis: "This method builds on difference-in-differences estimation, but uses systematically more attractive comparisons."

GDP) and trade (measured as logarithm of the sum of exports and imports as % of GDP). We then use the weights from the entropy-balancing in our estimations (as in, e.g., Patel and Seegert, 2015, Jacob et al., 2018). We find qualitatively similar results for the entropy-balanced sample (see the results in Appendix E.2).

One important concern that cannot be ruled out by testing for pre-trends in event studies is the presence of confounding events whose effects coincide in time with the treatment. The staggered introductions of the regulations that are widely spread over our sample period reduce concerns about concurrent shocks as does the within-country and within-industry triple difference-in-difference analysis we conduct; however, one might still be concerned that an individual (large) country could be driving the effect we observe, and then the threat of confounding events matters more. To alleviate this concern, we test what happens if we drop one treatment cohort at a time from our main specification. In untabulated tests, we find that the average effects on the number of deals involving loss targets in treated versus control countries are almost unchanged in magnitude (they lie between -0.27 and -0.35) and remain significant at the 1%-level of significance. Alternatively, we check robustness to dropping a country at a time (the coefficients remain between -0.34 and -0.22 and statistically significant). In an additional robustness analysis, we identify other changes in tax legislation that coincide with changes in anti-loss trafficking rules and could alter firm behavior. We discuss possible confounding events in Appendix D and control for them in all our regressions. (This includes controlling for changes in tax LCF and LCB legislation and corporate tax rate changes.) By controlling for these events, we avoid spurious correlations between our reform dates and industry performance or M&A. We observe some larger tax rate changes concurrent to the reforms we study. Instead of only controlling for these potential confounds, we also re-run the analysis in untabulated tests, limiting the sample to only those treatment events that were unaccompanied by large changes in the corporate income tax rates. We define a large change in the corporate tax rate as a change of more than three percentage points. This classifies the concurrent tax rate change in Lithuania in 2002 as large (a change of nine percentage points) and the change in Greece in 2014 (a change of six percentage points). In the reduced sample, which excludes both treatments, we continue to find a statistically significant reduction in the number of transactions involving loss targets. (The effect size is slightly smaller yet significant at the 1-percent level with a coefficient estimate of -0.28 instead of -0.31.) The effects on firm entry and survival, industry ROA including the split in high and low R&D industries are unchanged.

6 Conclusion

We analyze the economic impact of anti-loss trafficking rules in the context of M&A, young firm entry and exit, and performance in R&D-intensive industries. We exploit changes in anti-loss trafficking rules within the European Union and Norway that occurred between

1998 to 2019 to study the economic effect of these rules empirically. Our findings suggest that limiting the transfer of losses for tax purposes damps M&A. Furthermore, we find that restrictions on loss transfer affect industry dynamics, as evidenced by reduced entrant survival rates. Although some of these start-up deaths are compensated by new firm entrants due to freed-up market space, also loosening of regulation spurs firm entry and survival. Finally, we show that anti-loss trafficking rules impact firm performance, as return on assets significantly decreases in response to tighter legislation. The performance reduction is mostly concentrated in R&D-intensive industries. This is consistent with anti-loss trafficking rules impeding the performance of idiosyncratic loss firms. In sum, our findings are consistent with fewer financing opportunities for less-diversified loss firms, e.g., startups. After the loss, this will harm the firm's ability to attract equity financing and even survival rates if the firm has substantial tax losses.

Our findings have significant implications for policymakers and investors. Anti-loss trafficking rules aim to protect tax revenues and discourage tax-driven transactions. Our analysis demonstrates that limiting the transfer of tax losses crucially affects the market for corporate control. Furthermore, our research suggests that anti-loss trafficking rules can also negatively influence firms' entry and exit and industry performance. Therefore our study highlights the importance of carefully considering the consequences of anti-loss trafficking rules on market dynamics and aggregate economic outcomes.

Ultimately, policymakers face a trade-off. On the one hand, overly restrictive loss offset limitations might impair economic growth. Our results suggest that anti-loss trafficking can entail unintended consequences that are particularly detrimental to risk-taking and innovation. On the other hand, anti-loss trafficking rules can prevent abuse and protect tax revenues. Accrued LCFs can be substantial and, if a large part of them were offset, that could mean significant revenue losses for the tax authorities; e.g., the German Federal Office of Statistics reported that German corporations declared a total stock of €680 billion in LCFs in 2018.[35] The comprehensive assessment of the overall welfare impacts of the legislation remains beyond the scope of this study, as we lack administrative data on corporate tax returns and the stock of LCFs. We therefore leave it to future research to explore the trade-off between economic consequences and tax revenues.

[35]See DeStatis (n.d.), Über 39 Milliarden festgesetzte Körperschaftsteuer in 2018, available at: https://www.destatis.de/DE/Themen/Staat/Steuern/Unternehmenssteuern/koerperschaftsteuer.html.

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Tables and figures

Table 1: Anti-loss trafficking rules categories

Stringency	Description
0	No explicit anti-loss trafficking rule
1	Denial of loss transfer after change in ownership and activity (cumulative requirement)
2	Denial of loss transfer after change in activity
3	Denial of loss transfer after change in ownership
4	Denial of loss transfer after change in ownership or activity (fulfilment of one criteria sufficient)

Source: Bührle and Spengel [2020].

Table 2: Changes in anti-loss trafficking rules in the EU27, Norway and United Kingdom

Country	Year	Change
Tightening		
LT	2002	Introduction regime *cumulative activity and ownership change*
CZ	2004	Introduction regime *cumulative activity and ownership change*
NO	2004	Introduction regime *ownership change*
SI	2005	Introduction regime *ownership change*
PT*	2006	Change regime *activity change* to *activity or ownership change*
DE*	2008	Change regime *cumulative activity and ownership change* to *ownership change*
HR*	2010	Introduction regime *cumulative activity and ownership change*
HU	2012	Introduction regime *cumulative activity and ownership change*
GR	2014	Introduction regime *ownership change*
Loosening		
LV	2000	Change regime *ownership change* to *cumulative activity and ownership change*
HU	2001	Abolition regime *ownership change*
NL	2001	Change regime *ownership change* to *cumulative activity and ownership change*
SI*	2007	Change regime *ownership change* to *cumulative activity and ownership change*
PT	2014	Change regime *activity or ownership change* to *ownership change*
ES	2015	Change regime *ownership change* to *cumulative activity and ownership change*
DE	2016	Change regime *ownership change* to *cumulative activity and ownership change*
GR**	2018	Change regime *ownership change* to *cumulative activity and ownership change*

Notes: Changes in treatment of tax losses after an acquisition. Ownership-based are more restrictive than activity-based regulations. Cumulative rules are the least restrictive type of anti-loss trafficking rules. Retro-actively applicable rules are disregarded. * dropped from main analysis due to Financial Crisis (all treatments 2 years around the cirsis year 2008), ** dropped from stacked design due to repeated treatement in a time window <5 years. *Source:* Update of Bührle and Spengel [2020].

Table 3: Descriptive statistics

Variable	Obs	Mean	Median	Std. dev.	P25	P75
M&A outcomes						
Number of M&A	1,448	215.423	398.335	31	90	206
Number of M&A (log)	1,448	4.338	1.539	3.434	4.500	5.328
Industry-level outcomes						
Survival rate	26,987	0.560	0.134	0.472	0.548	0.642
Birth rate	27,976	0.103	0.056	0.067	0.092	0.130
Mean ROA, salesweighted	48,447	0.086	0.058	0.052	0.078	0.111
Country-level controls						
Lagged GDP growth (in %)	1,448	1.838	3.248	0.707	1.890	3.172
Lagged GDP (log)	1,448	27.060	1.170	26.349	26.797	28.520
Audit quality	1,448	5.687	0.691	5.345	5.853	6.197
Service sector growth (% of GDP)	1,448	65.365	5.713	62.053	65.304	69.288
Population in th. (log)	1,448	9.370	1.342	8.605	9.207	10.986
Lagged inflation	1,448	1.689	1.260	0.839	1.696	2.486
Trade (% of GDP, log)	1,448	4.528	0.545	4.113	4.392	4.754
CIT	1,448	28.041	7.235	24.500	28.000	33.990
LCF	1,448	0.876	0.330	1.000	1.000	1.000
LCB	1,448	0.304	0.460	0.000	0.000	1.000
EU membership	1,448	0.985	0.122	1.000	1.000	1.000
Escape clause	1,448	0.783	0.412	1.000	1.000	1.000
Industry-level controls						
Total assets (log)	48,447	20.720	1.640	19.718	20.809	21.756
Fixed assets (log)	48,447	19.663	1.602	18.705	19.750	20.677
Cash assets (log)	48,447	18.234	1.517	17.294	18.246	19.229

Notes: The table shows the descriptive statistics for the variables in our analysis in the stacked sample. All variables are defined in appendix A. Sources of variables are also provided in appendix A.

Table 4: Loss transfer and number of M&A

Outcome	*Volume of M&A Deals (log)*					
Sample	*Full Sample*		*Loss Targets*		*Non-Loss Targets*	
	(1)	(2)	(3)	(4)	(5)	(6)
Change ALT	-0.1955**		-0.3116***		-0.0877	
	(0.0767)		(0.0611)		(0.0634)	
Tightening ALT		-0.2356		-0.3673*		-0.0815
		(0.1850)		(0.2059)		(0.3026)
Loosening ALT		0.1955**		0.3116***		0.0877
		(0.0767)		(0.0611)		(0.0634)
Lagged GDP Growth	0.0051	0.0051	-0.0010	-0.0010	0.0086	0.0086
	(0.0053)	(0.0053)	(0.0074)	(0.0074)	(0.0058)	(0.0058)
Lagged GDP (log)	-0.1550	-0.1550	-0.8124**	-0.8124**	0.6201*	0.6201*
	(0.2761)	(0.2761)	(0.3639)	(0.3639)	(0.3138)	(0.3138)
Audit Quality	0.0349	0.0349	0.0609	0.0609	0.0066	0.0066
	(0.0763)	(0.0763)	(0.1241)	(0.1241)	(0.0920)	(0.0920)
Value Added, Service Sector	-0.0248***	-0.0248***	-0.0579***	-0.0579***	0.0081	0.0081
	(0.0092)	(0.0092)	(0.0149)	(0.0149)	(0.0089)	(0.0089)
Population	3.3208***	3.3208***	7.3381***	7.3381***	-0.3986	-0.3986
	(1.1722)	(1.1722)	(1.1991)	(1.1991)	(0.6708)	(0.6708)
Lagged Inflation	-0.0212	-0.0212	-0.0302**	-0.0302**	-0.0105	-0.0105
	(0.0134)	(0.0134)	(0.0146)	(0.0146)	(0.0233)	(0.0233)
Trade (log)	0.7268**	0.7268**	1.1147**	1.1147**	0.4843	0.4843
	(0.3351)	(0.3351)	(0.4256)	(0.4256)	(0.3405)	(0.3405)
CIT	0.0052	0.0052	-0.0061	-0.0061	0.0132*	0.0132*
	(0.0053)	(0.0053)	(0.0079)	(0.0079)	(0.0068)	(0.0068)
LCF	0.1253	0.1253	0.1691	0.1691	0.0722	0.0722
	(0.1155)	(0.1155)	(0.1647)	(0.1647)	(0.0904)	(0.0904)
LCB	0.6047***	0.6047***	0.4887***	0.4887***	0.7042***	0.7042***
	(0.1452)	(0.1452)	(0.1664)	(0.1664)	(0.1825)	(0.1825)
Escape Clause	-0.0400		-0.0557		0.0062	
	(0.2029)		(0.2216)		(0.3173)	
Observations	1,448	1,448	714	714	734	734
Adjusted R-squared	0.9618	0.9618	0.9422	0.9422	0.9687	0.9687
Country-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table shows the results for the stacked difference-in-differences regressions of change in anti-loss trafficking rules on logarithm of number of M&A. In columns (3)-(4), the sample only includes targets with pre-deal losses and in columns (5)-(6), the sample excludes targets with pre-deal losses. The analysis is conducted at the country-target type (loss or non-loss) level. All variables are defined in appendix A. Specification: $M\&A_{ctl} = \alpha + \beta_j * ChangeALT_{ct} + \rho * Controls_{ct} + \sigma * FE_c + \delta * FE_t + \epsilon_{ctl}$, where c stands for country, l for target type, and t for year. *, **, and *** indicate significance at the 10, 5 and 1% level. Standard errors: Clustered at country-cohort level.

Table 5: Triple-interacted loss transfer and number of M&A

Outcome	*Volume of M&A Deals (log)*			
	(1)	(2)	(3)	(4)
Change ALT	-0.0877			
	(0.0633)			
*Change ALT*Loss*	-0.2240**		-0.2099***	
	(0.0878)		(0.0574)	
Tightening ALT		-0.0815		
		(0.3019)		
*Tightening ALT*Loss*		-0.2858		-0.3007*
		(0.3650)		(0.1663)
Loosening ALT		0.0877		
		(0.0633)		
*Loosening ALT*Loss*		0.2240**		0.2099***
		(0.0878)		(0.0574)
Observations	1,448	1,448	1,428	1,428
Adjusted R-squared	0.9647	0.9647	0.9693	0.9693
Country-Loss-Cohort FE	Yes	Yes	Yes	Yes
Year-Loss-Cohort FE	Yes	Yes	Yes	Yes
Year-Country-Loss-Cohort FE	-	-	Yes	Yes
Loss * Country controls	Yes	Yes	Yes	Yes

Notes: The table shows the results for the stacked triple difference-in-differences regressions of change in anti-loss trafficking rules on logarithm of number of M&A. All right-hand side variables are interacted with the dummy *loss* indicating whether or not a target reports losses prior to the deal. In columns (1)-(2), we rerun the main specification with the interactions. In columns (3)-(4), we add country-year fixed effects. The analysis is conducted at the country-target type (loss or non-loss) level. All variables are defined in appendix A. Specification (1)-(2): $M\&A_{ctl} = \alpha + \beta_a * ChangeALT_{ct} + \beta_b * ChangeALT_{ct} * loss_l + \rho * Controls_{ct} + \zeta * Controls_{ct} * loss_l + \sigma * FE_{cl} + \delta * FE_{tl} + \epsilon_{ctl}$, and (3)-(4): $M\&A_{ctl} = \alpha + \beta_b * ChangeALT_{ct} * loss_l + \rho * Controls_{ct} * loss_l + \sigma * FE_{cl} + \delta * FE_{tl} + \gamma * FE_{ct} + \epsilon_{ctl}$, where c stands for country, l stands for target type (loss or non-loss), and t for year. Non-interacted terms are only omitted due to collinearity with fixed effects. *, **, and *** indicate significance at the 10, 5 and 1% level. Standard errors: Clustered at country-cohort level.

Table 6: Loss transfer and young firm exit and entry

Outcome	*Survival Rate*		*Birth Rate*	
	(1)	(2)	(3)	(4)
Change ALT	-0.0441**		-0.0112***	
	(0.0185)		(0.00327)	
Tightening ALT		-0.0275**		0.0134**
		(0.0118)		(0.00608)
Loosening ALT		0.0441**		0.0116***
		(0.0185)		(0.00331)
Observations	26,987	26,987	27,435	27,435
Adjusted R-squared	0.612	0.612	0.706	0.706
Industry-Year-Cohort FE	Yes	Yes	Yes	Yes
Country-Industry-Cohort FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

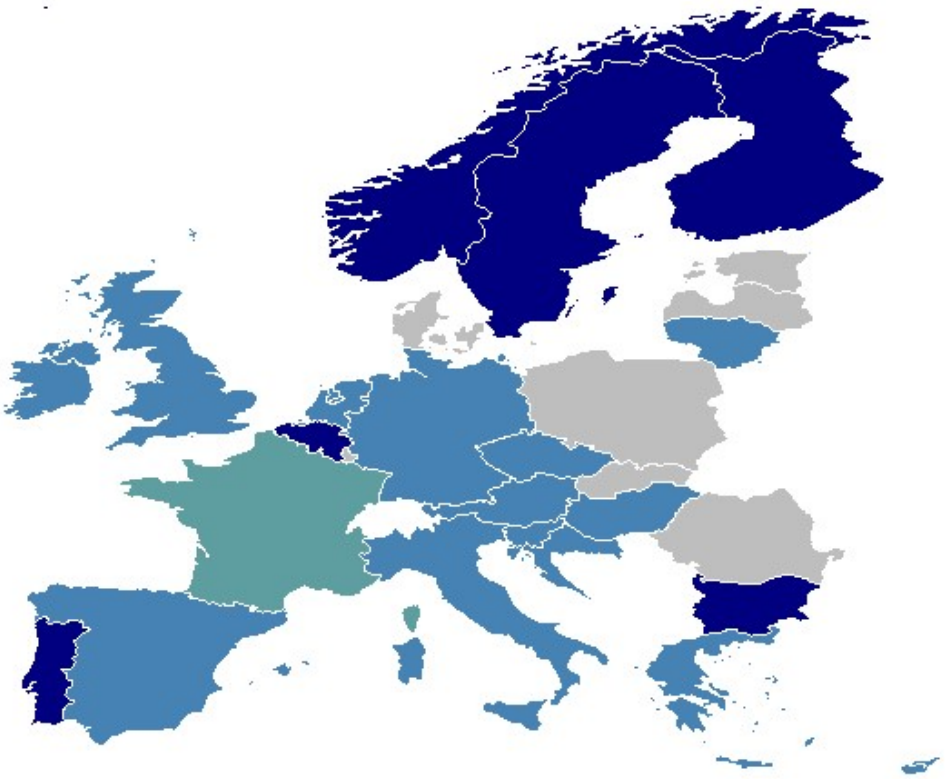
Notes: The table shows the results for the stacked difference-in-differences regressions of change in anti-loss trafficking rules on survival rate (columns (1)-(2)) and birth rate (columns (3)-(4)). Survival rate is the rate of survival of four year old entrants. Birth rate is the number of births as a percentage of the population of active enterprise. Specification: $Outcome_{ict} = \alpha + \beta_1 * ChangeALT_{ct} + \rho * Controls_{ict} + \sigma * FE_{ic} + \delta * FE_{iT} + \epsilon_{ict}$, where i stands for industry, c for country and t for year. The analysis is conducted at country-industry level. All variables are defined in appendix A. *, **, and *** indicate significance at the 10, 5 and 1% level. Standard errors: Clustered at country-industry-cohort level.

Table 7: Loss transfer and industry productivity

Outcome			*Mean ROA*			
Sample		High R&D	*Low R&D*		*Full Sample (Tripple DiD)*	
	(1)	(2)	(3)	(4)	(5)	(6)
Change ALT	-0.0159***		-0.0064**			
	(0.005)		(0.003)			
*Change ALT*R&D Intensive*					-0.0095***	
					(0.003)	
Tightening ALT		-0.0323***		-0.0100*		
		(0.007)		(0.005)		
*Tightening ALT*R&D Intensive*						-0.0239***
						(0.008)
Loosening ALT		0.0137***		0.0059**		
		(0.004)		(0.003)		
*Loosening ALT*R&D Intensive*						0.0072***
						(0.003)
Observations	6,762	6,762	41,522	41,522	48,447	48,447
Adjusted R-squared	0.779	0.779	0.718	0.718	0.535	0.535
Year-Industry-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Industry-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Country-Cohort FE	-	-	-	-	Yes	Yes
Controls	Yes	Yes	Yes	Yes	-	-
R&D Intensive * Controls	-	-	-	-	Yes	Yes

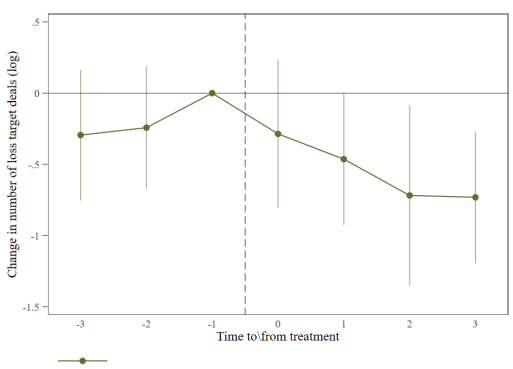
Notes: The table shows the results for the stacked difference-in-differences regressions of change in anti-loss trafficking rules on mean ROA. The regression is split between high (columns (1)-(2)) and low R&D intensive industries (columns (3)-(4)) classified based on NACE2 codes. Columns (5)-(6) are run on the full sample, where all right-hand side variables are interacted with the dummy *R&Dintensive* indicating whether or not an industry is classified as R&D intensive. Mean ROA is the sales-weighted average ROA across all firms in a country-industry cluster. All variables are defined in appendix A. The analysis is conducted at country-industry level. Specification (1)-(4) all right hand side variables (including fixed effects and controls) are interacted with the high R&D industry-intensity dummy and we add year-country fixed effects: $Outcome_{ict} = \alpha + \beta_1 * ChangeALT_{ct} + \rho * Controls_{ict} + \sigma * FE_{ic} + \delta * FE_{it} + \epsilon_{ict}$, and (5)-(6): $Outcome_{ict} = \alpha + \beta_1 * ChangeALT_{ct} * R\&DIntensive_i + \rho * Controls_{ict} + \zeta * Controls_{ict} * R\&DIntensive_i + \sigma * FE_{ic} * R\&DIntensive_i + \delta * FE_{it} * R\&DIntensive_i + \gamma * FE_{ct} + \epsilon_{ict}$, where i stands for industry, c for country and t for year. *, **, and *** indicate significance at the 10, 5 and 1% level. Standard errors: Clustered at country-industry-cohort level.

Figure 1: Loss transfer and M&A

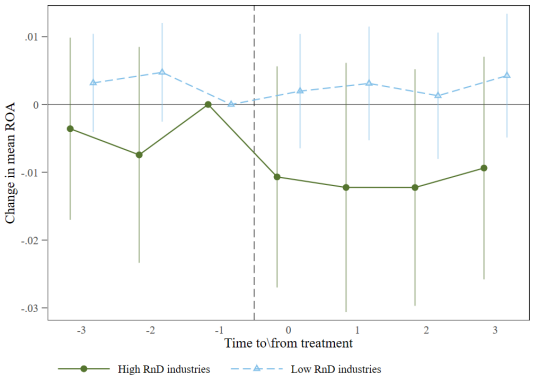


Notes: The figure displays the map of the EU27, Norway and United Kingdom and the status of anti-loss trafficking rules as of 2019. Countries with no rules are colored grey; countries which restrict the transfer of loss after a change in activity are colored green, countries which restrict the transfer of loss after a change in ownership and activity are colored dark blue, countries which restrict the transfer of loss after a change in ownership are colored light blue.

Figure 2: Descriptives: M&A and industry productivity trends in treated countries



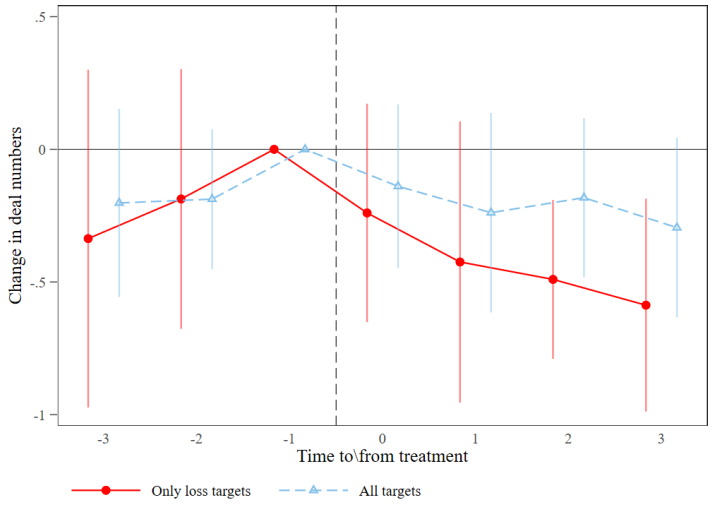
(a) Trend in number of loss target deals in treated countries (Log)



(b) Trend in ROA in treated countries by high/low R&D industries

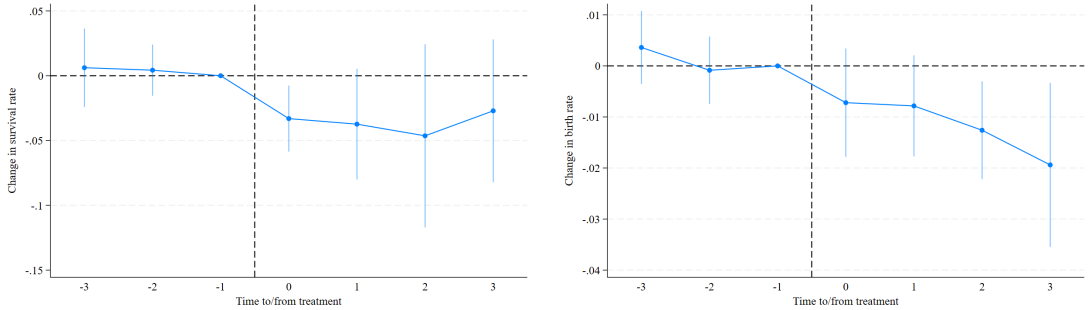
Notes: The figure plots the regression coefficients (the green and blue dots), $\beta_k s$, and 95 percent confidence intervals (the vertical lines) based on cluster robust standard errors (country-year) from the following specification: $Outcome_{(i)ct} = \alpha + \sum_{n=-4}^{4} \beta_n * ChangeALT_{cn} + \sigma * FE_c + \delta * FE_t + \epsilon_{(i)ct}$, where i denotes industry, c country and t year. The sample includes all countries which changed their anti-loss trafficking legislation. Panel A is estimated at the country-year level, and Panel B at the country-industry-year level. The outcome in Panel A is the Deal Number in loss targets, defined as the log of the number of M&A aggregated at the country level by year. Loss targets are proxied by those targets with accounting losses in the year prior to the deal. The outcome in Panel B is the sales-weighted mean ROA in an industry by year. The regression in Panel B is split into high versus low R&D industries. The treatment indicator takes value of 1 (-1) if a country tightens (loosens) anti-loss trafficking rules and the following years and zero otherwise. We include the treatment at the event time as well as four leads and four lags of the treatment indicator. The lead and lag dummies are binned at the beginning and end of the event window (after three years). Binned coefficients are not displayed. Coefficients are normalized to zero based on the level in the period preceding the treatment. Fixed effects include country and year fixed effects. Control variables are not included. All variables are defined in appendix A.

Figure 3: Loss transfer and M&A



Notes: The figure plots the event study regression coefficients displaying the change in outcome relative to the control group and time t-1, $\beta_k s$, and 95 percent confidence intervals (the vertical lines) based on cluster robust standard errors (country) from the following stacked specification: $Outcome_{ctl} = \alpha + \sum_{n=-4}^{4} \beta_n * ChangeALT_{cn} + \rho * Controls_{ct} + \sigma * FE_c + \delta * FE_t$, where c stands for country, l for target type (loss or non-loss), and t for year. The outcome is the volume of M&A, defined as the logarithm of the number of M&A, aggregated at the country-year-target type level. The blue line displays the test with all targets and the red line displays the test with a sample limited to loss targets. Loss targets are proxied by those targets with accounting losses in the year prior to the deal. The treatment indicator takes value of 1 (-1) if a country tightens (loosens) anti-loss trafficking rules and the following years and zero otherwise. We include the treatment at the event time as well as four leads and four lags of the treatment indicator. The lead and lag dummies are binned at the beginning and end of the event window. Binned coefficients are not displayed. Coefficients are normalized to zero based on the level in the period preceding the treatment. Fixed effects include country and year fixed effects. Control variables include a dummy for the existence of an escape clause, lagged GDP growth, log of GDP, audit quality, value added of the services sector, the log of population, lagged inflation, the log of trade, a dummy for EU membership, corporate income tax, a dummy for the existence of a generous loss carry-forward rule, a dummy for the existence of a loss carry-back rule. All variables are defined in appendix A. The standard errors are clustered at country-cohort level.

Figure 4: Loss transfer and young firm exit and entry

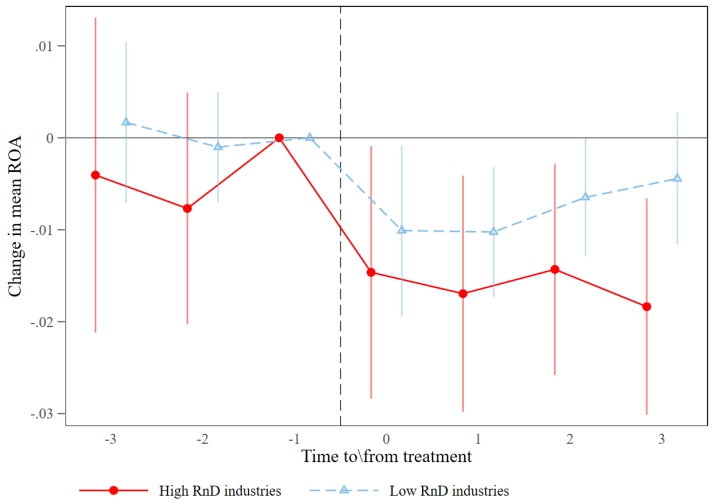


(a) Survival rate

(b) Birth Rate

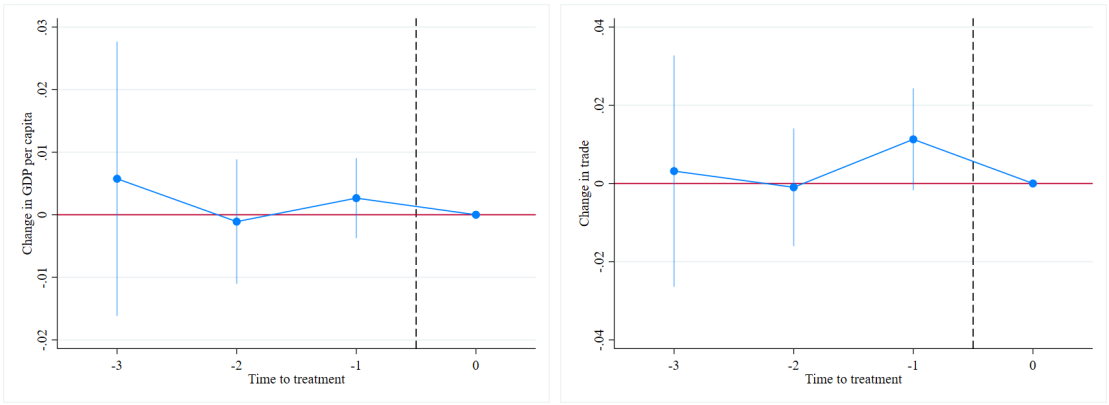
Notes: The figure plots the event study regression coefficients displaying the change in treated relative to the control group and time t-1, $\beta_k s$, and 95 percent confidence intervals (the vertical lines) based on cluster robust standard errors (country-year) from the following stacked and specification: $Outcome_{ict} = \alpha + \sum_{n=-4}^{4} \beta_n * ChangeALT_{cn} + \rho * Controls_{ict} + \sigma * FE_{ic} + \delta * FE_{it} + \epsilon_{ict}$, where i denotes industry, c country and t year. The outcome in Panel A is the survival rate, defined as the rate of survival of four year old entrants. The outcome in Panel B is the birth rate, defined as the number of births as a percentage of the population of active enterprise. Both outcomes are measured at the country-industry-year level. The treatment indicator takes value of 1 (-1) if a country tightens (loosens) anti-loss trafficking rules and the following years and zero otherwise. We include the treatment at the event time as well as four leads and four lags of the treatment indicator. The lead and lag dummies are binned at the beginning and end of the event window (after three years). Binned coefficients are not displayed. Coefficients are normalized to zero based on the level in the period preceding the treatment. Fixed effects include country-industry-cohort and year-industry-cohort fixed effects. Control variables include a dummy for the existence of an escape clause, lagged GDP growth, log of GDP, audit quality, value added of the services sector, the log of population, lagged inflation, the log of trade, a dummy for EU membership, corporate income tax, a dummy for the existence of a generous loss carry-forward rule, a dummy for the existence of a loss carry-back rule. All variables are defined in appendix A. The standard errors are clustered at country-industry-cohort level.

Figure 5: Loss transfer and mean industry productivity by R&D intensity



Notes: The figure plots the event study regression coefficients displaying the change in treated relative to the control group and time t-1, $\beta_k s$, and 95 percent confidence intervals (the vertical lines) based on cluster robust standard errors (country) from the following stacked specification: $Outcome_{ict} = \alpha + \sum_{n=-4}^{4} \beta_n * ChangeALT_{cn} + \rho * Controls_{ict} + \sigma * FE_{ic} + \delta * FE_{it} + \epsilon_{ict}$, where i denotes industry, c country and t year. The outcome is the sales-weighted mean industry ROA. The sample is split into high (red line) and low (blue line) R&D-intensive industries. The outcome is aggregated at the country-industry-year level. The treatment indicator takes value of 1 (-1) if a country tightens (loosens) anti-loss trafficking rules and zero otherwise. We include the treatment at the event time as well as four leads and four lags of the treatment indicator. The lead and lag dummies are binned at the beginning and end of the event window (after three years). Binned coefficients are not displayed. Coefficients are normalized to zero based on the level in the period preceding the treatment. Fixed effects include country-industry-cohort and year-industry-cohort fixed effects. Control variables include log of fixed assets, log of total assets, log of cash, a dummy for the existence of an escape clause, lagged GDP growth, log of GDP, audit quality, value added of the services sector, the log of population, lagged inflation, the log of trade, a dummy for EU membership, corporate income tax, a dummy for the existence of a generous loss carry-forward rule, a dummy for the existence of a loss carry-back rule. All variables are defined in appendix A. The standard errors are clustered at country-industry-cohort level.

Figure 6: Test of confounding events: GDP and trade pre-trends



(a) Test of pre-trends in GDP

(b) Test of pre-trends in trade

Notes: The figure plots the event study regression coefficients displaying the change in treated relative to the control group and time 0, $\beta_k s$, and 95 percent confidence intervals (the vertical lines) based on cluster robust standard errors (country) from the following stacked specification: $Outcome_{ct} = \alpha + \sum_{n=-4}^{4} \beta_n * ChangeALT_{cn} + \sigma * FE_c + \delta * FE_t + \epsilon_{ct}$, where c denotes country and t denotes year. The outcome in panel A is the log of GDP, PPP (constant 2017 international $). The outcome in panel B is the logarithm of sum of exports and imports (as % of GDP). Both outcomes are measured at the country-year level. The treatment indicator takes value of 1 (-1) if a country tightens (loosens) anti-loss trafficking rules and the following years and zero otherwise. We include the treatment at the event time as well as four leads and four lags of the treatment indicator. The lead and lag dummies are binned at the beginning and end of the event window (after three years). Binned coefficients are not displayed. Coefficients are normalized to zero based on the level in the period preceding the treatment. Only lead coefficients are reported, since we are interested in trends in economic outcomes pre-treatment that might confound our treatment effects. Fixed effects include country-cohort and year-cohort fixed effects. Control variables are not included. All variables are defined in appendix A. The standard errors are clustered at country-cohort level.

Internet Appendix

A Variable definitions

Change ALT	Change ALT increases (decreases) by 1 in the year a country tightens (loosens) anti-loss trafficking rules and in the following years. The value does not change the following years as long as the regulation stays in place. Source: hand-collected.
Tightening ALT	Tightening ALT takes a value of 1 in the year a country tightens anti-loss trafficking rules and in the following years. Source: hand-collected.
Loosening ALT	Loosening ALT takes the value of 1 in the year a country loosens anti-loss trafficking rules and in the following years. Source: hand-collected.
Deal number	The logarithm of the number of M&A aggregated at country level by year. Source: BVD's Zephyr.
Birth rate	The number of enterprise births as a percentage of the population of active enterprises measured in t+1. According to Eurostat, a birth occurs only if an enterprise starts operations from scratch. This excludes births due to mergers, break-ups, split-off or restructuring of a set of enterprises and entries resulting from a change in activity. Source: Eurostat - Business Demography.
Survival rate	The survival rate of entrants by industry where we consider as entrant, firms of four years of age and take the ratio of surviving entrants to all entrants of that age group. According to Eurostat, survival occurs if an enterprise is active in terms of employment and/or turnover. Two types of survival can be distinguished: 1. An enterprise born in year xx is considered to have survived in year xx+1 if it is active in terms of turnover and/or employment in any part of year xx+1 (= survival without changes).

	2. An enterprise is also considered to have survived if the linked legal unit(s) have ceased to be active, but their activity has been taken over by a new legal unit set up specifically to take over the factors of production of that enterprise (= survival by takeover). Deaths do not include exits from the population due to mergers, takeovers, break-ups or restructuring of a set of enterprises nor from a change of activity. An enterprise is included in the count of deaths only if it is not reactivated within two years. Source: Eurostat - Business Demography.
Mean ROA	Sales-weighted average of return on assets across firms in the same industry-country-year cluster. Averages based on less than 50 firms are disregarded. Source: BVD's Orbis.
Lagged GDP growth	The lagged annual GDP growth in %. Source: World Bank - World Development Indicators.
Lagged GDP, log	The log of lagged GDP, PPP (constant 2017 international $). Source: World Bank - World Development Indicators.
Audit quality	Strength of auditing and reporting standards index (1-7, best). Source: World Economic Forum - Global Competitiveness Report.
Service sector growth	The annual growth rate of value added of the services sector in percentage of GDP. Source: World Bank - World Development Indicators.
Population, log	The log of total population in thousands. Source: United Nations.

Lagged inflation	Lagged inflation. Source: World Bank - World Development Indicators.
Trade, log	Lagged logarithm of sum of exports and imports (as % of GDP). Source: World Bank - World Development Indicators.
EU membership	A dummy for country EU Membership. Source: European Commission.
CIT	The statutory corporate income tax rate. Source: European Commission.
LCF	A dummy equal to 1 for a loss carry-forward available for more than five years in a country and 0 otherwise. Source: hand-collected.
LCB	A dummy equal to 1 for a loss carry-back available in a country and 0 otherwise. Source: hand-collected.
Escape clause	A dummy for anti-loss trafficking rules that offer an escape clause. Source: hand-collected.
Fixed assets, log	The log of the industry-country sum of fixed assets. Source: BVD's Orbis.
Total assets, log	The log of the industry-country sum of total assets. Source: BVD's Orbis.
Cash assets, log	The log of the industry-country sum of cash assets. Source: BVD's Orbis.

B Treatment of losses in tax law

The offset of losses for tax purposes is subject to several restrictions. Intra-periodic offset can be restricted to the same source of income that generated the losses (so-called horizontal loss offset). This is often the case for capital losses. Business losses can usually also be offset against profits from other sources (so-called vertical loss offset). If losses cannot be offset in the same period, they have to be carried over to other periods in the past (LCBs) or future (LCFs). These tax loss assets carry value (assuming the company becomes profitable or used to generate profits in the past) as they embody potential tax savings (Amir and Sougiannis [1999]). The value of these tax assets depends on the expected time needed to offset them against positive income. Longer time horizons embody higher risk and lower present values of current losses. Inter-periodic loss offset is also subject to several restrictions.

First, temporal and/or absolute restrictions limit the amount of losses that can be offset in a given year. All countries that allow for a LCB limit the amount of years a loss can be carried back to. The variation in temporal restrictions for LCFs ranges from five years to no time limit. Absolute restrictions are usually expressed in a specified percentage above an allowance. As a result, companies with large LCFs cannot reduce their full taxable income and are obliged to pay taxes on the residual (so-called minimum taxation).

Second, events such as a change in ownership or activity trigger anti-loss trafficking rules which can lead to the forfeiture of accumulated tax LCFs. Absent tax loss transfer limitations, unprofitable corporations with high LCFs can be acquired and merged with profitable firms to set off the otherwise worthless losses. The restrictions aim to prevent loss trafficking; in other words, the acquisition of shell companies with significant LCFs but which lack any other economic rationale. Legislators deem these transactions abusive as the sole purpose is the transfer of the tax assets. Abuse is assumed based on codified criteria, and the taxpayer bears the burden of proof to show otherwise.

If anti-loss trafficking rules are triggered, accumulated LCFs are forfeited altogether. They can neither be offset against profits of the target nor the acquiring entity. Thus, the tax assets are not usable even if the target eventually turns profitable again after an acquisition, rendering the LCFs worthless.

The provisions commonly refer to a significant change in ownership and/or a change in activity as triggering criteria. What constitutes such a significant change differs depending on the national legislation. In general, a change in ownership is considered harmful when the controlling majority of the corporation carrying the losses changes. The aim is to limit the benefits of LCFs to the shareholders that bore them. Changes in activity are often evaluated based on changes in assets, turnover, or targeted customer markets. The legislator ties the use of losses to profits generated by the activity that caused them in the first place. There are different types of anti-loss trafficking rules. Cumulative regulations require a change in ownership and connected change in activity. If there is either only a change in ownership or only a change in activity, this type of restriction is not triggered. Alternatively, rules can

mandate the forfeiture of losses after a change in activity independent of any changes at the ownership level. A third type of anti-abuse regulation relies solely on a change in ownership. Fourth, countries that relate their loss transfer restrictions to either a change in ownership or a change in activity pose the most restrictive rules, as the fulfillment of either criterion is sufficient.

In some cases, exemptions from the regulations are allowed through "escape clauses". Depending on the national legislation, anti-loss trafficking rules may not apply in situations such as reorganizations within groups, for publicly traded companies, if adequate hidden reserves exist, or if sufficient evidence of economic reasons is presented to tax authorities (such as the rehabilitation of a company).

C Anecdotal evidence for loss trafficking

E.g., Erickson et al. [2019] provide anecdotal evidence in their appendix that losses can be considered an important factor in acquisitions. In the following, we additionally present some cases where anti-loss trafficking rules also played an important role.

C.1 Acquisition of Wachovia (USA)

Due to the financial crisis, the banking group Wachovia incurred substantial losses. Citigroup agreed to purchase the company for around 2 billion dollars. Just a few days later, Wells Fargo declared interest as well and offered a multiple of the amount, approximately 15 billion dollar.[36]

The cause for this substantial increase in perceived value of Wachovia was generally perceived to be a tax rule clarification that was issued by the US Internal Revenue Service just a day after Citigroup had announced the deal (and was revoked a few months later).[37] Based on the notice, losses and deductions attributable to loans of a bank were not subject to the Section 382 limitations after changes in ownership. Any buyer of Wachovia was thus able to utilize the accumulated losses to offset taxable income even after the acquisition.[38]

C.2 Case 3 K 65/08 (Germany)

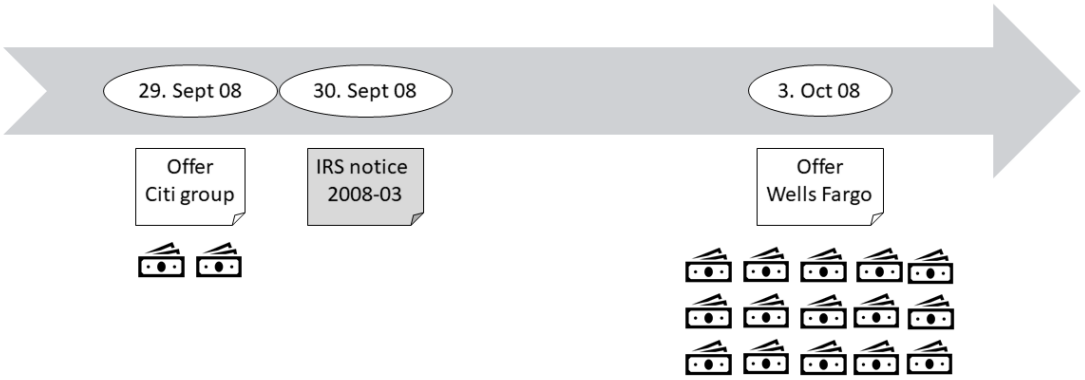
B GmbH (B) was founded in 1991 and was conducting business as holding of the B-Group with ten to eleven employees. The B-Group traded in computer games and accessories and sometimes also manufactured them; B itself participated in some computer game trades. The firm was incurring losses from 1996 to 1998 due to partial depreciation of the holdings in its subsidiaries. At the end of 1998, business was discontinued by selling the subsidiaries to a third party and laying off all employees. B's assets were mainly consistent of liquid assets. At this point, the company had accumulated LCFs for corporate tax purposes up to around DM 35 million. In 2000, A AG (A) bought the shares in B GmbH from the

[36]See Crowell (6 Oct 2008), Tax Notice Drives Wachovia Takeover Turmoil, available online at https://www.crowell.com/NewsEvents/AlertsNewsletters/all/Tax-Notice-Drives-Wachovia-Takeover-Turmoil [Accessed 4 April 2022].

[37]See Crowell (6 Oct 2008), Tax Notice Drives Wachovia Takeover Turmoil, available online at https://www.crowell.com/NewsEvents/AlertsNewsletters/all/Tax-Notice-Drives-Wachovia-Takeover-Turmoil [Accessed 4 April 2022]; The Paypers (06 Oct 2008), Wachovia abandons Citi for surprise Wells Fargo deal, available online at https://thepaypers.com/payments-general/wachovia-abandons-citi-for-surprise-wells-fargo-deal–735571 [Accessed 4 April 2022]; The Street (10 Nov 2011), How Wells Fargo Won the Tax-Dodging Trophy, available online at https://eu.wickedlocal.com/story/bulletin-tab/2011/11/10/how-wells-fargo-won-tax/65157599007/ [Accessed 4 April 2022].

[38]IRS (2008), Application of Section 382(h) to banks. Notice 2008-83, available online at https://www.irs.gov/pub/irs-drop/n-08-83.pdf [Accessed 4 April 2022].

Figure 7: Timeline acquisition of Wachovia

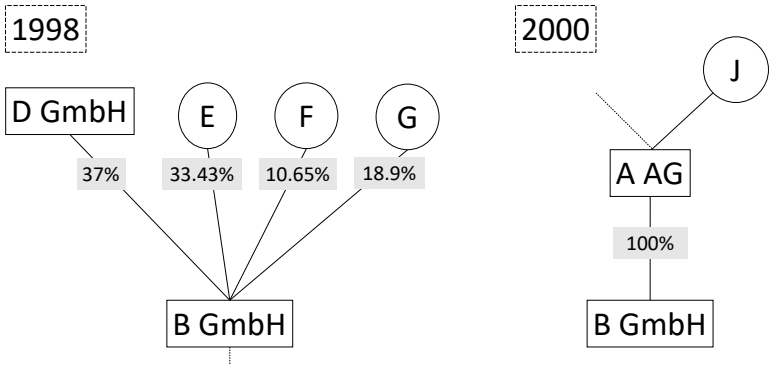


Note: Timeline of the offers by citi group and Wells Fargo for Wachovia in 2008 around the publication of IRS notice 2008-03, which allowed the transfer of $ 60 billion in losses that were sitiing on Wachovia's balance sheet.

previous owners. The purchase agreements included a section stating that an additional purchase price was to be paid in case the LCFs could be offset against taxable income of B earned after the acquisition. B changed its focus to the investment in high-tech start-ups, effectively changing its business activity from an executive holding of an entertainment software group to a venture capital firm, acquiring substantial shareholdings in start-ups in the "new economy". B was later merged with A in 2001.

The court denied the offset of B's LCFs with profits from the new business activities, stating that the plaintiff's only aim when acquiring the shares in B was to take advantage of its LCFs. This inference arises in particular from the remuneration agreed specifically for the transfer of the LCFs.The plaintiff did not intend to operate in the former business area of B, entertainment software. A acquired a company whose assets consisted almost exclusively of liquid receivables and investments, i.e., a cash box, at a price that corresponded exactly to this value. The visible reason for the acquisition instead of liquidation of B were the use of the existing LCFs. The fact that B was merged with the plaintiff in 2000 to simplify the corporate structure also shows that B was active in the same business area as the plaintiff that B, as an independent company, was of no use to the plaintiff and that the latter was only striving to transfer the LCFs to itself.

Figure 8: Schematic representation shareholdings B GmbH



Note: Schematic representation of the shareholdings in the case 3 K 65/08 at the financial court Hamburg, judgement from 20.04.2010. The court denied the use of accumulated losses of around DM 35 Mio after the company had been sold to the A AG, having assessed the transaction as an abusive trade in losses.

C.3 Urban Redevelopment Corporation v. C.I.R (USA)

Urban Redevelopment Corporation (Urban) was a New York corporation established in 1949 and dealing with real and personal property. The corporation incurred substantial losses in 1950 and 1951 and was inactive during 1952. In 1953, the sole owner, Fred F. Stoneman sold the corporation to Randolph Rouse (Rouse), a Virginian land developer and builder. The place of business of Urban was consequently moved to Virginia. The stated purpose for the acquisition were plans, drawings and specifications belonging to the corporation. However, Rouse failed to obtain these items after some ineffectual efforts, refraining from taking legal action against the former director that supposedly had them in their possession. In 1954 and 1955 Urban constructed and sold residential properties in Virginia, generating substantial profits. The resulting income taxes were reduced by offsetting the previously accumulated LCFs, claiming deductions of roughly USD 46,000.

The tax court considered the avoidance of income tax Rouse's principal purpose in acquiring Urban's stock and denied the loss offset. The court found that, while Rouse had his certified public accountant thoroughly verify Urban's LCFs, he failed to check the existence of the plans he claimed seeking to acquire. Overall, the court assessed Route's stated economic reasons as "inherently improbable".

D Confounding events

Oftentimes, changes in tax loss transfer restrictions are part of bigger tax law packages than include other, potentially confounding, legislative measures. More restrictive general LCF legislation, i.e., shorter time horizons and absolute limits, decreases the value of accumulated LCFs and thus acquisition prices (e.g., Erickson et al. [2019]). Consequently, one would expect stricter temporal and absolute loss restrictions exerting an opposing effect to stricter anti-loss trafficking rules. Lower corporate taxes are associated with higher acquisition activity (e.g., Arulampalam et al. [2019],Todtenhaupt and Voget [2021]). However, in the tax loss setting higher taxes also imply higher tax savings if LCFs can be set off and thus increases in expected values of the tax assets. The direction of potentially confounding effects is unclear. Lower taxes on capital gains from the sale of shares in subsidiaries decreases the costs imposed on sellers and thus the required acquisition premium (e.g., Todtenhaupt et al. [2020]), leading to a positive effect on acquisition activity. In our empirical specification, we specifically control for the time-variant country-specific aspects by including variables for tax rates as well as LCB and LCF provisions in the estimation equation. Nevertheless, in the following we discuss concurrent changes in tax law that fall together with the changes in anti-loss trafficking rules we use for our identification.

The overview below presents and overview over relevant tax changes at the time of change in anti-loss trafficking rules. At the time of change in anti-loss trafficking rules (column ALT), we list changes in temporal and absolute restrictions of LCFs (columns LCF time and limit), statutory corporate income tax (column CIT) and capital gains taxes levied on the sales of shares of substantial holdings in non-listed subsidiaries (column Cap. Gains). For each column, changes in legislation are indicated with the status before and after the change; if there was no change the space is left blank. Around half of the changes in tax loss transfer restrictions were accompanied by additional changes in legislation in the same year.

Concurrent changes in tax law

Country	Year	ALT	LCF time	LCF limit	CIT	Cap. gains
CZ	2003	-	7		0.31	
	2004	cum	5		0.28	
DE*	2007	cum			0.25	
	2008	own			0.15	
DE	2015	own				
	2016	cum				
ES	2014	own	18		0.30	
	2015	cum	inf		0.28	
GR	2013	-			0.20	
	2014	own			0.26	
HR*	2009	-				
	2010	cum				
HU	2000	own				
	2001	-				
HU	2011	-		-		
	2012	cum		x		
LT	2001	-			0.24	
	2002	cum			0.15	
LV	1999	own				
	2000	cum				
NL	2000	own				
	2001	cum				
PT*	2005	act				
	2006	act/own				
PT	2013	act/own	5		0.25	50% exemption
	2014	own	12		0.23	full exemption
SI	2004	-				
	2005	own				
SI*	2006	own	7		0.25	no exemption
	2007	cum	inf		0.23	50% exemption
NO	2003	-				no exemption
	2004	own				full exemption

Notes: The overview shows concurrent changes in tax legislation at the time of change in anti-loss trafficking rules (ALT). Listed are changes in loss carry-forward (LCF) time and limit, statutory corporate income tax (CIT) and capital gains taxes on sales of shares of substantial holdings in non-listed subsidiaries.* dropped from main analysis due to Financial

Crisis (all treatments 2 years around the cirsis year 2008), ** dropped from stacked design due to repeated treatement in a time window <5 years. *Sources:* IBFD Country Analyses, EY Worldwide Corporate Tax Guides.

E Robustness checks

E.1 Main Result without controls

Table 8: No Controls - Loss transfer and number of M&A

Outcome	Number of M&A (log)					
Sample	Full sample		Split sample			
			Loss targets		Non-loss targets	
	(1)	(2)	(3)	(4)	(5)	(6)
Change ATLT	-0.0982		-0.1729***		-0.0310	
	(0.0900)		(0.0641)		(0.0724)	
Tightening of ATLT		-0.0466		-0.1186		0.0417
		(0.2261)		(0.1655)		(0.1812)
Loosening of ATLT		0.1253*		0.1995***		0.0668
		(0.0647)		(0.0475)		(0.0552)
Observations	1,448	1,448	707	707	727	727
Adjusted R-squared	0.9591	0.9591	0.9595	0.9595	0.9696	0.9696
Country-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table shows the results for the stacked and entropy-balanced difference-in-differences regressions of change in anti-loss trafficking rules on logarithm of number of M&A without controls. In columns (3)-(4), the sample only includes targets with pre-deal losses and in columns (5)-(6), the sample excludes targets with pre-deal losses. The analysis is conducted at the country-target type (loss or non-loss) level. All variables are defined in appendix A. Specification: $M\&A_{ctl} = \alpha + \beta_j * ChangeALT_{ct} + \rho * Controls_{ct} + \sigma * FE_c + \delta * FE_t + \epsilon_{ctl}$, where c stands for country, l for target type, and t for year. *, **, and *** indicate significance at the 10, 5 and 1% level. Standard errors: Clustered at country-cohort level.

E.2 Entropy Balanced Results

Table 9: Entropy Balanced - Loss transfer and number of M&A

Outcome	Number of M&A (log)					
Sample	Full sample		Split sample			
			Loss targets		Non-loss targets	
	(1)	(2)	(3)	(4)	(5)	(6)
Change ALT	-0.1368*		-0.2466***		-0.0184	
	(0.0815)		(0.0591)		(0.0696)	
Tightening ALT		-0.2685**		-0.3888**		-0.1253
		(0.1272)		(0.1523)		(0.1784)
Loosening ALT		0.1368*		0.2466***		0.0184
		(0.0815)		(0.0591)		(0.0696)
Observations	1,434	1,434	707	707	727	727
Adjusted R-squared	0.9679	0.9679	0.9624	0.9624	0.9733	0.9733
Country-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table shows the results for the stacked and entropy-balanced difference-in-differences regressions of change in anti-loss trafficking rules on logarithm of number of M&A. In columns (3)-(4), the sample only includes targets with pre-deal losses and in columns (5)-(6), the sample excludes targets with pre-deal losses. The analysis is conducted at the country-target type (loss or non-loss) level. All variables are defined in appendix A. Specification: $M\&A_{ctl} = \alpha + \beta_j * ChangeALT_{ct} + \rho * Controls_{ct} + \sigma * FE_c + \delta * FE_t + \epsilon_{ctl}$, where c stands for country, l for target type, and t for year. *, **, and *** indicate significance at the 10, 5 and 1% level. Standard errors: Clustered at country-cohort level.

Table 10: Entropy Balanced - Triple-DiD loss transfer and number of M&A

Outcome	Volume of M&A Deals (log)			
	(1)	(2)	(3)	(4)
Change ALT	-0.0184			
	(0.0694)			
Change ALT * Loss	-0.2282**		-0.1997***	
	(0.0910)		(0.0540)	
Tightening ALT		-0.1253		
		(0.1780)		
Tightening ALT * Loss		-0.2635		-0.2701**
		(0.2339)		(0.1141)
Loosening ALT		0.0184		
		(0.0694)		
Loosening ALT * Loss		0.2282**		0.1997***
		(0.0910)		(0.0540)
Observations	1,434	1,434	1,414	1,414
Adjusted R-squared	0.9756	0.9756	0.9806	0.9806
Country-Loss-Cohort FE	Yes	Yes	Yes	Yes
Year-Loss-Cohort FE	Yes	Yes	Yes	Yes
Year-Country-Loss-Cohort FE	-	-	Yes	Yes
Loss * Country controls	Yes	Yes	Yes	Yes

Notes: The table shows the results for the stacked and entropy-balanced triple difference-in-differences regressions of change in anti-loss trafficking rules on logarithm of number of M&A. All right-hand side variables are interacted with the dummy *loss* indicating whether or not a target reports losses prior to the deal. In columns (1)-(2), we rerun the main specification with the interactions. In columns (3)-(4), we add country-year fixed effects. The analysis is conducted at the country-target type (loss or non-loss) level. All variables are defined in appendix A. Specification (1)-(2): $M\&A_{ctl} = \alpha + \beta_a * ChangeALT_{ct} + \beta_b * ChangeALT_{ct} * loss_l + \rho * Controls_{ct} + \zeta * Controls_{ct} * loss_l + \sigma * FE_{cl} + \delta * FE_{tl} + \epsilon_{ctl}$, and (3)-(4): $M\&A_{ctl} = \alpha + \beta_b * ChangeALT_{ct} * loss_l + \rho * Controls_{ct} * loss_l + \sigma * FE_{cl} + \delta * FE_{tl} + \gamma * FE_{ct} + \epsilon_{ctl}$, where c stands for country, l stands for target type (loss or non-loss), and t for year. Non-interacted terms are only omitted due to collinearity with fixed effects. *, **, and *** indicate significance at the 10, 5 and 1% level. Standard errors: Clustered at country-cohort level.

Table 11: Entropy balanced - Loss transfer and young firm exit and entry

Outcome	Survival rate		Birth rate	
	(1)	(2)	(3)	(4)
Change ALT	-0.0205**		-0.00882***	
	(0.00848)		(0.00181)	
Tightening ALT		-0.0497***		0.0188***
		(0.0186)		(0.00285)
Loosening ALT		0.0205**		0.00884***
		(0.00848)		(0.00182)
Observations	24,615	24,615	24,684	24,684
Adjusted R-squared	0.763	0.763	0.817	0.817
Country-Industry-Cohort FE	Yes	Yes	Yes	Yes
Industry-Year-Cohort FE	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes

Notes: The table shows the results for the stacked and entropy-balanceddifference-in-differences regressions of change in anti-loss trafficking rules on survival rate (columns (1)-(2)) and birth rate (columns (3)-(4)). Survival rate is the rate of survival of four year old entrants. Birth rate is the number of births as a percentage of the population of active enterprise. Specification: $Outcome_{ict} = \alpha + \beta_1 * ChangeALT_{ct} + \rho * Controls_{ict} + \sigma * FE_{ic} + \delta * FE_{iT} + \epsilon_{ict}$, where i stands for industry, c for country and t for year. The analysis is conducted at country-industry level. All variables are defined in appendix A. *, **, and *** indicate significance at the 10, 5 and 1% level. Standard errors: Clustered at country-industry-cohort level.

Table 12: Entropy balanced - Loss transfer and industry productivity

Outcome	Mean ROA					
Sample	High R&D		Low R&D		Triple-DiD	
	(1)	(2)	(3)	(4)	(5)	(6)
Change ALT	-0.0073***		-0.0048**			
	(0.003)		(0.002)			
Change ALT * R&D Intensity					-0.0042*	
					(0.002)	
Tightening ALT		-0.0222*		-0.0065		
		(0.012)		(0.007)		
Tightening ALT * R&D Intensity						-0.0143
						(0.010)
Loosening ALT		0.0050*		0.0046**		
		(0.003)		(0.002)		
Loosening ALT * R&D Intensity						0.0027
						(0.003)
Observations	6,276	6,276	38,513	38,513	44,705	44,705
Adjusted R-squared	0.857	0.857	0.805	0.805	0.825	0.825
Year-Industry-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Industry-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Country-Cohort FE	-	-	-	-	Yes	Yes
Controls	Yes	Yes	Yes	Yes	-	-
R&D Intensity * Controls	-	-	-	-	Yes	Yes

Notes: The table shows the results for the stacked and entropy-balanced difference-in-differences regressions of change in anti-loss trafficking rules on mean ROA. The regression is split between high (columns (1)-(2)) and low R&D intensive industries (columns (3)-(4)) classified based on NACE2 codes. Columns (5)-(6) are run on the full sample, where all right-hand side variables are interacted with the dummy $R\&Dintensive$ indicating whether or not an industry is classified as R&D intensive. Mean ROA is the sales-weighted average ROA across all firms in a country-industry cluster. All variables are defined in appendix A. The analysis is conducted at country-industry level. Specification (1)-(4): $Outcome_{ict} = \alpha + \beta_1 * ChangeALT_{ct} + \rho * Controls_{ict} + \sigma * FE_{ic} + \delta * FE_{it} + \epsilon_{ict}$, and (5)-(6): $Outcome_{ict} = \alpha + \beta_1 * ChangeALT_{ct} * R\&DIntensive_i + \rho * Controls_{ict} + \zeta * Controls_{ict} * R\&DIntensive_i + \sigma * FE_{ic} * R\&DIntensive_i + \delta * FE_{it} * R\&DIntensive_i + \gamma * FE_{ct} + \epsilon_{ict}$, where i stands for industry, c for country and t for year. *, **, and *** indicate significance at the 10, 5 and 1% level. Standard errors: Clustered at country-industry-cohort level.

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